PB-229 788

MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES POLLUTION ABATEMENT, PUBLIC HEALTH. APALACHICOLA-CHATTAHOOCHEE-FLINT BASIN

Public Health Service
Atlanta, Georgia

June 1962

DISTRIBUTED BY:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

APALACHICOLA -
CHATTAHOOCHEE -
FLINT BASIN

PB 229 788

41

TECHNICAL MEMORANDA FOR WATER SUPPLIES POLLUTION ABATEMENT AND PUBLIC HEALTH

NtIS may

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

PREPARED FOR
UNITED STATES STUDY COMMISSION, SOUTHEAST RIVER BASINS
BY
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, REGION IV
WATER SUPPLY & POLLUTION CONTROL PROGRAM
ATLANTA, GEORGIA
JUNE 1962

175

1a

Library
Environmental Protection Agency
Region VII

UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service, Region IV
Water Supply and Pollution Control Program

Technical Memoranda

for

Municipal, Industrial and Domestic Water Supplies
Pollution Abatement
Public Health

APALACHICOLA-CHATTAHOOCHEE-FLINT BASIN

Prepared for

United States Study Commission,
Southeast River Basins
Atlanta, Georgia
June 1962

i b

TABLE OF CONTENTS

Page

LIST OF TABLES vii

LIST OF FIGURES ix

INTRODUCTION

PREFACE

Scope I-2

Authority I-2

Economic Basis for Planning I-3

RESPONSIBILITIES

Public Health Service, Department of Health, Education, and Welfare I-4

Corps of Engineers, Department of the Army I-5

Soil Conservation Service, Department of Agriculture I-5

Forest Service, Department of Agriculture I-5

Geological Survey, Department of the Interior I-6

National Park Service, Department of the Interior I-6

Atomic Energy Commission I-6

Alabama State Board of Health I-6

Alabama Water Improvement Commission I-7

Local Health Departments (Alabama) I-7

Alabama Oil and Gas Board I-7

Alabama Division of Game and Fish I-7

Alabama Geological Survey I-8

Florida State Board of Health I-8

Local Health Departments (Florida) I-8

RESPONSIBILITIES - Cont'd

Florida Board of Conservation I-9

Florida Game and Fresh Water Fish Commission I-9

Florida Geological Survey I-9

Georgia Department of Public Health I-9

Local Health Departments (Georgia) I-11

Georgia Oil and Gas Commission I-11

Georgia Game and Fish Commission I-11

Georgia Water Quality Council I-11

Georgia Department of Mines, Mining, and Geology I-11

Georgia Resources Commission I-12

Water Purveyors I-12

DESCRIPTION OF THE BASIN

General I-12

Climate and Hydrology I-13

Population I-14

Resources I-15

MUNICIPAL, INDUSTRIAL, AND
DOMESTIC WATER SUPPLIES

INTRODUCTION

Scope of Memorandum W-2

Procedures and Investigations W-2

Basic Assumptions W-3

QUANTITY AND QUALITY OF WATER AVAILABLE FOR WATER SUPPLIES

Surface Water W-3

Ground Water W-4

MUNICIPAL WATER SUPPLIES

Inventory W-5

Present Status of Water Supply Systems W-5

Water Supply System Requirements for 1960 .... W-6

Future Water Supply System Requirements W-6

Future Water Supply Problems W-7

Annual Costs W-7

Benefits W-35

DOMESTIC WATER SUPPLIES

Inventory W-36

Present Status ot Water Supply Systems W-36

Water Supply System Requirements for 1960 .... W-36

Future Water System Requirements W-37

Annual Costs W-37

INDUSTRIAL WATER SUPPLIES

Inventory W-38

Present Status of Water Supply Systems W-38

Future Water Supply Requirements for 1975 and 2000 ... W-39

Future Water Supply Problems W-39

Annual Costs W-39

Benefits W-44

SUMMARY W-44

POLLUTION ABATEMENT

INTRODUCTION

Scope of Memorandum P-2

Procedures and Investigations P-2

INTRODUCTION - Cont'd

Basic Assumptions P-3

General P-4

INVENTORY OF POLLUTION ABATEMENT

Sources of Pollution P-5

Existing Sewage Treatment Facilities P-15

Effects on Streams P-16

POLLUTION ABATEMENT REQUIREMENTS FOR 1960

Sewerage P-19

Treatment Facilities P-19

Other Needs P-20

FUTURE POLLUTION ABATEMENT REQUIREMENTS

Projections P-26

Sewerage P-26

Treatment Facilities P-27

LOW FLOW AUGMENTATION

General P-41

Areas Where Augmentation Is Not Needed P-46

Areas Where Augmentation Is Needed P-46

ANNUAL COSTS AND BENEFITS

Financing P-50

Annual Costs for 1960 .... P-50

Annual Costs for 1975 .... P-51

Annual Costs by 2000 .... P-52

Benefits P-52

SUMMARY P-52

(5/15/62)

PUBLIC HEALTH

INTRODUCTION PH-1

VECTOR CONTROL

- Introduction PH-2
- Existing Vector Problems PH-2
- Status of Existing Programs PH-6
- Existing Needs PH-8
- Potential Problems and Solutions PH-9
- Costs and Benefits PH-10

AIR POLLUTION

- Problems PH-18
- Status of Existing Programs PH-18
- Existing Needs PH-19
- Potential Problems and Solutions PH-19
- Costs and Benefits PH-20

RADIOLOGICAL HEALTH

- Problems PH-21
- Status of Existing Programs PH-21
- Existing Needs PH-24
- Potential Problems and Solutions PH-24

SOLID WASTES

- Introduction PH-25
- Problems PH-25
- Status of Existing Programs PH-25
- Existing Needs PH-26
- Potential Problems and Solutions PH-26

SOLID WASTES - Cont'd

Costs and Benefits PH-28

SUMMARY AND CONCLUSIONS

Summary PH-30

Conclusions PH-30

APPENDIX PH-32

BIBLIOGRAPHY

LIST OF TABLES

MUNICIPAL, INDUSTRIAL, AND DOMESTIC WATER SUPPLIES

Table — Page

W-1 Basic Data on Municipal Water Supply Systems W-8

W-2 Municipal Water Supply Systems Estimated Needs and Costs for 1960 .... W-15

W-3 Municipal Water Supply Systems Estimated Needs and Costs for 1975 .... W-19

W-4 Municipal Water Supply Systems Estimated Needs and Costs for 2000 .... W-27

W-5 Basic Data on Industrial Water Supply Systems W-40

W-6 Industrial Water Supply Systems Estimated Needs and Costs - 1975 and 2000 .... W-42

POLLUTION ABATEMENT

P-1 Basic Data on Sources of Municipal Pollution P-6

P-2 Basic Data on Sources of Industrial Pollution P-12

P-3 Municipal Pollution Abatement Estimated Needs and Costs for 1960 .... P-21

P-4 Industrial Pollution Abatement Estimated Needs and Costs for 1960......... P-24

P-5 Sources of Municipal Sewage - 1975 and 2000 .... P-29

P-6 Sources of Industrial Waste - 1975 and 2000 .... P-35

P-7 Municipal Pollution Abatement Estimated Costs - 1975 and 2000 .... P-37

P-8 Industrial Pollution Abatement Estimated Costs - 1975 and 2000 .... P-40

P-9 Minimum Flow Requirements P-42

P-10 Reservoir Storage Needs P-49

PUBLIC HEALTH

Table		Page
PH-1	Vector Problems and Programs	PH-12
PH-2	Radioactivity in Water	PH-22
PH-3	Land Requirements for Sanitary Landfills	PH-27
PH-4	Solid Wastes Program Annual Costs	PH-28

LIST OF FIGURES

Figure		Page
I-1	Southeast River Basins	I-1
W-1	Municipal and Industrial Water Supplies	W-1
P-1	Sources of Pollution	P-1

INTRODUCTION

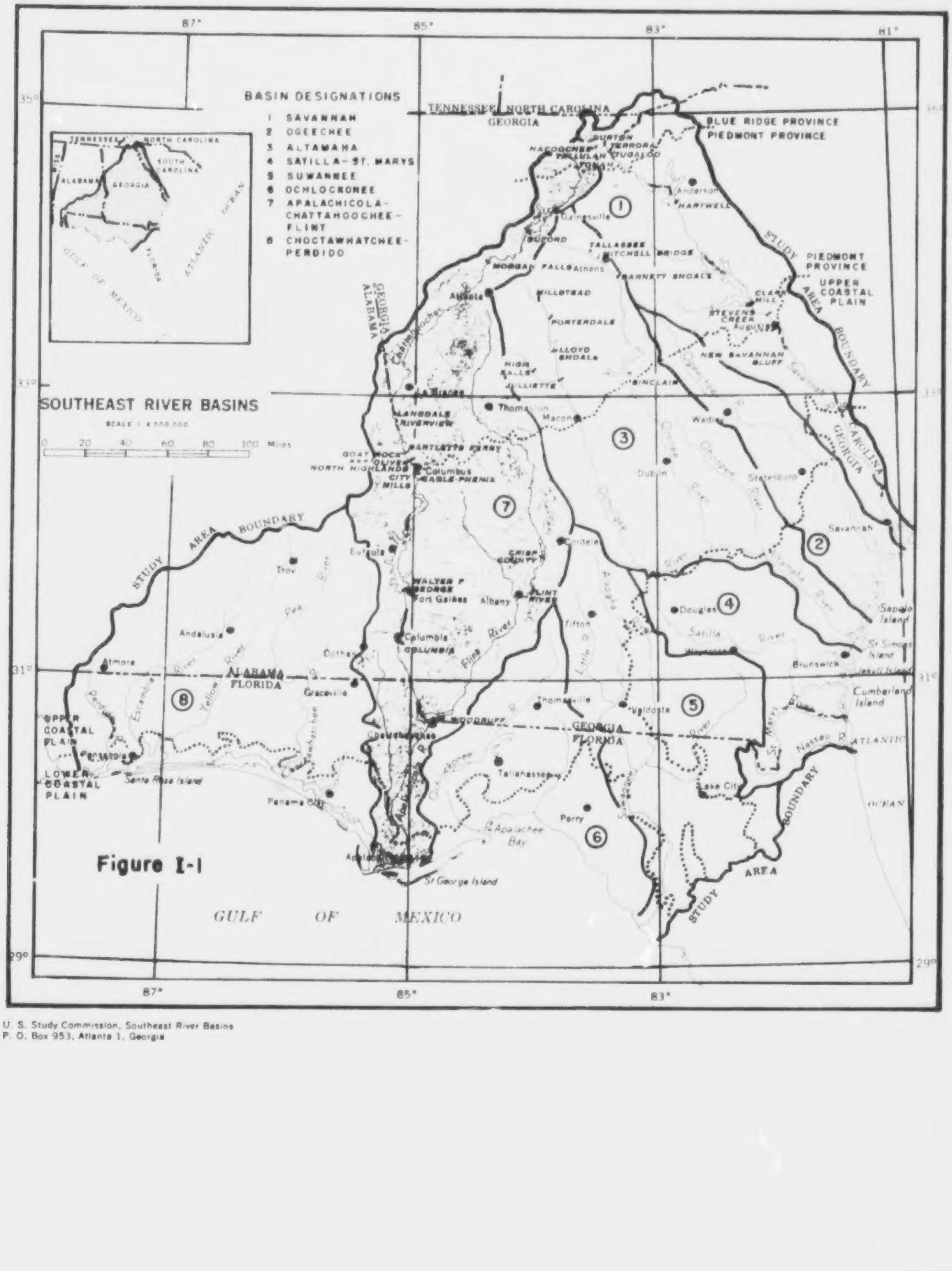


Figure I-1

U. S. Study Commission, Southeast River Basins
P. O. Box 953, Atlanta 1, Georgia

PREFACE

SCOPE

The U. S. Study Commission, Southeast River Basins, on December 30, 1959 and March 11, 1960, requested the assistance of the Public Health Service in:

(1) Formulating a domestic, municipal and industrial water supply plan, including pertinent economic studies,

(2) Formulating a water quality management plan including water pollution abatement and pertinent economic studies, and

(3) Formulating a plan for the protection of public health related to plans for the conservation, utilization, and development of land and water resources of the study area.

The Study Commission proposed that the Public Health Service compile the required basic data and prepare "single-purpose technical memoranda" on each of the above subjects and that these technical memoranda set forth the requirements for development to serve the above functions at present, in 1975, and 2000 in each of the eight river basins of the study area.

These memoranda on the Apalachicola-Chattahoochee-Flint Basin have been prepared in fulfillment of the Commission's requests. They have been divided into three separate memoranda: MUNICIPAL, INDUSTRIAL, AND DOMESTIC WATER SUPPLIES; POLLUTION ABATEMENT; and PUBLIC HEALTH. In addition, a separate report has been prepared by the Public Health Service for the U. S. Study Commission: Water Quality Basic Data - Southeast River Basins, dated 1961. This report covers the Apalachicola-Chattahoochee-Flint Basin as well as the seven other Basins within the U. S. Study Commission area.

The purpose of these memoranda is to provide data and information to the U. S. Study Commission - SERB on the present and projected status of water supply, pollution abatement, and public health facilities and programs for use in the preparation of a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Apalachicola-Chattahoochee-Flint Basin.

AUTHORITY

The Study Commission's requests are in partial fulfillment of its obligation under Public Law 85-850 which states in part:

"In carrying out the purpose of this Act it shall be the policy of Congress to utilize the services, studies, surveys, and continuing investigational programs of the departments, bureaus, and agencies of the United States." The Act also states that the Commission may "secure directly from any executive department, bureau, agency, commission, office, independent establishment, or instrumentality, information, suggestions, estimates, and statistics for the purpose of this Act, and each such department, bureau, agency, board, commission, office establishment, or instrumentality is authorized to furnish such information, suggestions, estimates and statistics directly to the Commission, upon request by the Chairman or Vice Chairman".

The authority for the Public Health Service to undertake this study and the preparation and submission of these technical memoranda stems from the above and from the Public Health Service Act of 1944 (Public Law 410, 78th Congress) and its amendments; the Federal Water Pollution Control Act (Public Law 660, 84th Congress), and its amendments; Federal legislation on air pollution (Public Law 159, 84th Congress), with amendments, related miscellaneous provisions of other statutes; and the Public Health Service Regulations.

Public Law 85-850, under which the U. S. Study Commission operates, provides for investigations and studies and the preparation of a comprehensive and coordinated plan for the conservation, utilization, and development of land and water resources in the study area. In this plan formulation, the law specified, among other things, the inclusion of plans for:

(1) domestic and municipal supplies;

(2) possibilities of industrial development and utilization;

(3) pollution abatement and the protection of public health; and

(4) other beneficial and useful purposes.

ECONOMIC BASIS FOR PLANNING

Projections for 1975 and 2000 in this report were made using estimates of economic development furnished to the Public Health Service by the U. S. Study Commission, Southeast River Basins. The pattern of the future economy stems mainly from projections of population, employment, and income furnished by the Commission. The basic aggregate projections for these three components are considered by the Commission to be relatively firm. The breakdown of the basic projections into their different components and the derivation of data for river basins is based, in some cases, on limited information.

The Commission emphasizes that these are preliminary estimates and that the pattern of the projected economy should not be taken as a rigid goal but should be considered flexible and subject to modification and refinement as the results of future studies become available.

RESPONSIBILITIES

The basic responsibility for the administration of Federal programs in municipal water supply, pollution control, and public health is vested in the Public Health Service. State programs and responsibilities are administered by the State health departments and water pollution control agencies. In the administration of these Federal and State programs, cooperation and assistance of other agencies with interests in these fields are obtained. The responsibilities and interests of all Federal, State, and local agencies in municipal water supply, pollution control, and public health programs in the Apalachicola-Chattahoochee-Flint Basin are enumerated below.

PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

The Public Health Service serves in a consulting capacity to other Federal agencies and to the State and local health departments on matters relating to water supply, water pollution control, vector control, and other matters related to public health; makes investigations and studies; does scientific research in the above fields; collects vital statistics; and operates certain medical care and quarantine programs. In protecting the public health, the Service is responsible for developing and recommending procedures for the prevention and control of mosquitoes and other vectors associated with Federal water development projects.

As part of its responsibilities under the Federal Water Pollution Control Act (Public Law 660, 84th Congress) as amended, the Service is required to prepare or develop in cooperation with other Federal agencies, State and interstate water pollution control agencies, municipalities and industries, comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary conditions of surface and underground waters. In the development of such comprehensive programs, due regard is given to the improvements which are necessary to conserve such waters for public water supplies; propagation of fish and aquatic life and wildlife; recreational purposes; and agricultural, industrial, and other legitimate uses. The Service is further authorized to advise any Federal construction agency concerning the inclusion of storage in any proposed reservoir for regulations of stream flow for the purpose of water quality control.

The Public Health Service is authorized to make joint investigations, with any such agencies, of the condition of any waters in any State or States, and of the discharge of any sewage, industrial wastes, or substance which may adversely affect such waters.

Section 8 (a) of Public Law 660 states that "The pollution of interstate or navigable waters in or adjacent to any State or States (whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters), which endangers the health or welfare of any persons shall be subject to abatement as provided in this Act."

The Public Health Service works closely with State agencies and makes invesitgations and studies relating to health and pollution control aspects of development programs pertaining to municipal, industrial, and domestic water supplies. The Service also has the responsibility of collecting and disseminating basic data on radiological, chemical, physical, and biological water quality and other information insofar as such data and information relate to water pollution and the prevention and control thereof.

CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

The Corps of Engineers operates the Federal program for the improvement and maintenance of rivers and other waterways in the interest of navigation and flood control. Water conservation and other water use functions beneficial to the public are considered in carrying out investigations and construction of water projects. Health matters relating to these projects include vector control, sanitation of work camps, recreation, water supplies, and water pollution abatement.

SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE

The Soil Conservation Service, under Public Law 566, 83rd Congress, as amended, prepares watershed work plans for small watersheds to assure water-flow retardation and soil erosion prevention. In the development of these work plans, consideration is given to water use functions beneficial to the people of the area, including irrigation, stock watering, and fish and wildlife propagation and municipal and industrial water supply. Control of insects around the watershed and use of water for domestic purposes are also given consideration.

FOREST SERVICE, DEPARTMENT OF AGRICULTURE

The Forest Service is responsible for the development and management of National Forests to preserve and increase the multiple benefits from these natural resources. Good forest management retards rapid runoff and prevents soil erosion, thus reducing pollution from natural sources. Sanitation of public facilities in National Forests is under the supervision of the Forest Service and privately operated facilities are regulated by use permits issued by the Service. It is to be noted, however, that Section 480, Title 16, U. S. Code states that jurisdiction over persons within National Forests should not be affected by the reason of these forests' existence. Thus, health and sanitation in National Forests is of concern to State and local health authorities.

GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

The Geological Survey is primarily a fact finding and research agency. It collects, analyzes, and interprets basic data on water, mineral, and land resources, and prepares topographic and geological maps and reports as a prerequisite to planning, constructing, and operating projects for the development and utilization of these natural resources.

NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR

The National Park Service administers programs for the National Parks, monuments, historic sites, and similar areas. It has the responsibility for maintaining sanitary and healthful conditions in these areas. The Service cooperates with other agencies in investigating the recreational possibilities at proposed reservoir projects and in planning for their protection, development, and utilization.

ATOMIC ENERGY COMMISSION

The Atomic Energy Act of 1954 authorizes the Atomic Energy Commission to regulate the use of certain radioactive materials and certain facilities, which produce or use these materials, to protect against hazards to life or property. A National Committee on Radiation Protection, comprised of members of several Federal agencies including the Public Health Service and professional organizations, prepares recommendations on protection from radioactive substances.

ALABAMA STATE BOARD OF HEALTH

The Alabama Board of Health is authorized to adopt and issue rules and regulations establishing proper methods and details for administering the health and quarantine laws of the State. These rules and regulations have the force and effect of law (Title 22, Section 7). Functions of the Board include establishment of water purity standards, enforcement of regulations governing impoundment of waters, cooperation in ground and surface water surveys, and studies of water use and consumption (Title 22, Section 7, 9, 11, 117-129, 131, 135-140).

In general, the State Board of Health is responsible for the general supervision and control of all water supplies and waterworks in the State insofar as purity, potability, wholesomeness, and physical quality of waters furnished may affect the public health or comfort. In this connection the Board consults and advises municipal authorities and other persons engaged in waterworks installation and improvement as to appropriate sources of supply and methods of assuring purity. A separate statutory provision authorizes examination of sources of supply, tanks, reservoirs, pumping stations, and avenues of conveyance of drinking water, and whenever these water are found polluted, or conditions are discovered likely to bring about their pollution, proper steps are taken to improve or correct these conditions.

Permits are issued by the Board to supply water for human consumption or domestic uses, and investigations are made of proposed or existing water supplies and waterworks and plans and specifications therefor. Persons holding permits may be issued orders necessary to secure an adequate supply of safe, potable water. Orders of the Board of Health relating to water supplies and waterworks are enforced by injunction, and violation may result in criminal prosecution.

ALABAMA WATER IMPROVEMENT COMMISSION

The Alabama Water Improvement Commission establishes standards for recognized limits of pollution and is responsible for developing and enforcing the water pollution control program of the State. (Code of Alabama, 1955 Supp., Title 22, Section 140). Pollution of Alabama waters is controlled and abated by the Commission through issuance of administrative orders (subject to court review) to persons responsible for the pollution, and by regulating the conditions under which sewage, industrial, and other waste may be discharged into waters of the State. The authority to control and abate water pollution is limited to what is reasonable, scientifically possible, economically feasible, and physically attainable from a practical standpoint. The State Health Department is the administrative agency for the Commission.

LOCAL HEALTH DEPARTMENTS (ALABAMA)

There are 67 county health departments which function on a full-time basis. According to the statutues, county health officers are responsible for sole direction of all sanitary and public health work within the county, including incorporated municipalities.

ALABAMA OIL AND GAS BOARD

The Oil and Gas Board is directed to prevent the pollution of fresh water supplies by oil, gas, or salt water (Title 26, 1955 Supplement, Section 179).

ALABAMA DIVISION OF GAME AND FISH

Primary responsibility for protection of fish and wildlife lies with the Division of Game and Fish of the Alabama Department of Conservation. In this connection the Division maintains certain pollution control activities with regard to fish and wildlife habitat.

ALABAMA GEOLOGICAL SURVEY

This State agency cooperates with the U. S. Geological Survey and with local and state agencies on water resource studies. In connection with the collection and inventory of basic water data, the Geological Survey aids in the development of overall natural resource plans for the State.

FLORIDA STATE BOARD OF HEALTH

Rules and regulations for the betterment and protection of the public health of the State of Florida are included in the State's Sanitary Code Law (Chapter 381, Florida Statutes). The adoption, promulgation, and enforcement of this Code is the responsibility of the Florida State Board of Health. Among the 35 chapters of the Sanitary Code relating to the public health engineering and sanitation program of the State, there are included rules and regulations governing public water supplies, public sewerage systems, pollution of streams and waters, swimming pools and bathing beaches, impoundments, and private water supply wells.

Other statutes administered by the State Board of Health are the Tourist Camp Law (Chapter 513, Florida Statutes); The Nuisance Law (Chapter 386, Florida Statutes); Supervision by the State Board of Health over Pollution of All Underground and Surface Waters in the State and Over Water Supplies, Sewerage Systems, Sewage Waste and Refuse Disposal Systems in the State (Chapter 381 and Chapter 387, Florida Statutes); Pollution of Waters (Chapter 387 Florida Statutes); the Swimming Pool Law (Chapter 514, Florida Statutes); and the Air Pollution Control Act (Chapter 403, Florida Statutes 1957).

The Board has the authority to issue permits and review plans and specifications for the installation, alteration or extension of a water supply or sewerage system, and refuse or sewage disposal facilities to serve more than 25 people. The Board is further authorized to enforce any provisions of the Sanitary Code; conduct experiments relating to the purification of water and treatment of sewage, waste or refuse; consult with and advise counties, municipalities and other persons as to source of water supply, methods of water purification, and disposal of drainage, sewage or refuse; to establish water purity standards for the streams of the State; and to control air pollution in accordance with rules and regulations adopted by the State Air Pollution Control Commission.

LOCAL HEALTH DEPARTMENTS (FLORIDA)

In Florida, local health departments are organized on a county, multicounty, or city-county basis. Health officers in charge of these local units are deputized agents of the State Health Officer for the purpose of carrying out the provisions of the Sanitary Code of the State. Local health departments have the power to enforce rules, regulations, orders, and ordinances regarding the public health in accordance with the state laws. Local health departments also have the power to make sanitary inspections and isolate, quarantine, and abate nuisances.

FLORIDA BOARD OF CONSERVATION

The State Board of Conservation, through its Department of Water Resources, advises the Florida State Cabinet on measures to conserve and promote wider use of water resources; advises and coordinates the efforts of local agencies, water control authorities, municipalities, counties, and individuals to achieve improved conservation, control, and use; and conducts an educational program to inform the public of sound State water resource policies and procedures.

FLORIDA GAME AND FRESH WATER FISH COMMISSION

The State Game and Fresh Water Fish Commission collects and compiles data of a biological and economic nature and recommends measures to mitigate losses or increases in the value of various water control structures to wildlife. The Commission also represents fish and wildlife interests in the planning of water resource projects.

FLORIDA GEOLOGICAL SURVEY

This Agency collects and compiles basic hydrological data on water resources of the State; locates uncontrolled flowing artesian wells and with the Water Resources Department cooperates with the U. S. Geological Survey on water surveys.

GEORGIA DEPARTMENT OF PUBLIC HEALTH

The State has retained all responsibilities and duties for the health of the public not otherwise granted to the Federal government in the Federal Constitution or by Acts of Congress. The State operates under the police power, inherent in the sovereign State to enact and enforce laws to protect and promote the health, safety, morals, order, peace, comfort, and general welfare of the people. Among the powers of the State Board of Health are the following:

1. Adopt rules, regulations, and orders.

2. Enforce State laws, regulations, and orders.

3. Isolate and quarantine, make sanitary investigations and inspections, and collect vital statistics.

4. Review plans and specifications for any new municipal water systems to be installed, or changes to be made in any existing system by any city, corporation, partnership, or individual.

5. Inspect the source of municipal water supply, and to determine if the water is impure and dangerous to individuals or to the public generally.

6. Act in a consultative capacity to local agencies.

7. Approve and regulate the impounding of waters as they affect insect and vector control.

The Georgia Water Quality Act (Laws of Georgia, 1957, Act No. 491) provides for the control of water quality within the State and the regulation of public water supply treatment facilities. It prohibits the discharge of sewage, industrial wastes, or other wastes into the waters of the State which would adversely affect the health of the people or render such waters unsuitable for their then current uses, and provides for the treatment of such wastes. It provides for the issuance of certificates to persons discharging or permitting to be discharged into the waters of the State any sewage, industrial wastes, or other wastes.

The Act declares it to be the policy of the State of Georgia that the water resources of the State shall be utilized prudently to the maximum benefit of the people without so impairing the quality of the water resources as to jeopardize public water supplies and public health, and without interfering unreasonably with beneficial use of the water resources for recreation, fish and wildlife development, agriculture, and the industrial development of the State's natural resources and its manpower. The State water pollution control agency (State Board of Health) is charged with the responsibility, and has the authority to require the use of reasonable methods to prevent and control the pollution of the waters of the State.

The State Board of Health under the Water Quality Act, has the responsibility and power to, as it deems necessary, establish such standards of quality for any waters in relation to the reasonable and proper use thereof, and such general policies and standards, relating to any existing or future pollution of such waters. The State Board of Health has the power to issue orders directing any particular person or persons to secure within the time specified therein, such operating results as are reasonable and practicable of attainment toward the control, abatement, and prevention of pollution of the waters of the State and the preservation of the necessary quality for the reasonable use thereof.

The State Board of Health has the power to establish such policies, requirements, and/or standards governing the source, distribution, purification, treatment and storage of water for public or community water supply systems as it deems necessary for the reasonable and proper use thereof in conformity with the intent of the Water Quality Act. The Act states that it shall be unlawful for any person to erect, construct, enlarge, extend, open, reopen, or operate any public or community water supply system, including storage, distribution, purification treatment facilities or works, without having first secured from the Board of approval of the source of water supply; the means and methods of treating, purifying and storing water; plans and specifications for the construction of facilities or works; and the operation thereof.

LOCAL HEALTH DEPARTMENTS (GEORGIA)

Georgia laws provide for the formation of county boards of health. These are created for the purpose of carrying out State rules, regulations, and orders as well as adopting other regulatory measures needed for potecting the public health within the local jurisdiction. Local Boards of Health in Georgia have the power to adopt rules, regulations, and orders; enforce State laws, regulations, and orders; enforce local regulations and ordinances; make sanitary inspections and investigations, isolate, quaratine, and abate nuisances.

GEORGIA OIL AND GAS COMMISSION

The Georgia Oil and Gas Commission is authorized to make rules, regulations, and orders for the prevention of the pollution of fresh water supplies by oil, gas or salt water (1955 Cum. Supp., Title 43, Section 713).

GEORGIA GAME AND FISH COMMISSION

In the protection of fish and other aquatic life, the Georgia Game and Fish Commission is vitally interested in habitat waters. This agency cooperates with other State and Federal agencies in invesigations and studies of water quality as related to fish and other aquatic life. This Agency enforces legislation against the use of explosives, poisonous substances, etc. for the purpose of catching, killing, taking or harming fish (1955 Cum. Supp., Title 45, Section 703).

GEORGIA WATER QUALITY COUNCIL

The Georgia Water Quality Council makes recommendations to the State Board of Health with regard to regulations, procedures, standards, waste disposal certificates, and policies governing public and community water supplies and waste disposal into waters of the State for controlling pollution and quality of such waters.

GEORGIA DEPARTMENT OF MINES, MINING, AND GEOLOGY

The Division of Conservation in this Department collects and compiles water resources data and cooperates with the U. S. Geological Survey, U. S. Soil Conservation Service, and State Soil Conservation Committee on surface and ground water surveys and chemical quality of waters.

GEORGIA RESOURCES COMMISSION

The Commission is responsible for inventorying the State's water resources and gathering such data as are necessary for determining what further legislation is needed with regard to quantitative control of the State's water resources. A State water engineer, appointed by the Commission is authorized to employ a water resources fact finding and research staff to be known as the Georgia State Water Survey.

WATER PURVEYORS

The general responsibility for the purity of water is shared by health authorities, water purveyors, owners of property, and water users. Those duties of health authorities and other agencies have been presented. The purveyor of water must safeguard it while in the water supply system, with some overlapping responsibilities with the property owner once the water reaches the property line. Users should be careful not to contaminate the water once it is drawn from the outlet.

Regulations controlling the manufacturing, importing, or bottling of water in the Basin are administered by the Alabama, Florida, and Georgia State Boards of Health.

DESCRIPTION OF THE BASIN

GENERAL

The Apalachicola-Chattahoochee-Flint Basin is bounded on the north by the Tennessee River Basin; on the east by the Savannah, Altamaha, Suwannee, and Ochlockonee Basins; on the south by the Gulf of Mexico; and on the west by the Coosa and Choctawhatchee-Perdido Basin. The 19,300 square mile drainage area of the Basin includes portions of north and western Georgia, eastern Alabama, and the central Florida Panhandle(Figure I-1).

The Apalachicola River is formed by the confluence of the Chattahoochee River, which rises in the Blue Ridge Mountains of northeastern Georgia, and the Flint River, which has its source in the Piedmont Plateau near Atlanta, Georgia. This confluence is located at the Southwest corner of the State of Georgia in the Coastal Plain Province. About 6,600 square miles of the tri-river Basin is in the Piedmont Province, and about 12,800 square miles lies in the Coastal Plain; only 2 percent is in the Blue Ridge Province.

Upper reaches of the Chattahoochee portion of the Basin are characterized by the steep slopes of mountain streams, but below Gainesville, Georgia, the slope is fairly uniform. From West Point, Georgia, southward, the west bank of the Chattahoochee forms the Alabama-Georgia boundary. The course of the river has unusually long and straight reaches through the middle of the valley, and there are no important tributaries.

The Flint River, forming near Atlanta, flows in an easterly arc to its confluence with the Chattahoochee at the Florida State line. The river is generally spring-fed in the Coastal Plain and is characterized by relatively clear water.

Largest of the freshwater streams in Florida is the Apalachicola River. From its beginning the river flows southerly until it reaches the Gulf of Mexico. It is a wide, shallow, meandering stream which carries a heavy silt load from the clay hills of Georgia and Alabama. Near the mouth the watershed is unsurveyed jungle and swampy flatlands.

The two largest reservoirs in the Basin at the present time are Lake Sidney Lanier (usable capacity 1,628,000 acre-feet) near Buford, Georgia, and Jim Woodruff Reservoir (usable capacity 385,000 acre-feet) at the Florida State line. Under construction are two additional dams, Columbia at Columbia, Alabama, and Walter F. George near Ft. Gaines, Georgia. When this construction is complete, the Apalachicola-Chattahoochee River will be navigable from Columbus, to the mouth, 160 miles. Hydroelectric power is produced at all the major reservoirs, and from several smaller projects throughout the Basin.

CLIMATE AND HYDROLOGY

Mean annual Basin temperatures vary from 59°F in the Blue Ridge area to 68°F on the Gulf Coast. In the north, the frost free growing season averages 214 days while in Florida this season is extended to approximately 270 days. In the Apalachicola watershed, continuous periods of several years have occurred when there was no frost.

Rainfall records indicate average annual precipitation of 61 inches in the north, to 49 inches in the mid portion, to nearly 59 inches near the Gulf. The 31 year average stream discharge of the Apalachicola at Chattahoochee, Florida is 21,160 cfs. Maximum discharge of record was 293,000 cfs which occurred on March 20, 1959, and the minimum flow recorded on October 27, 1954, was 4,950 cfs. Flows are regulated by Lake Sidney Lanier, Bartletts Ferry Reservoir near Columbia and Jim Woodruff Reservoir.

As mentioned before the Apalachicola-Chattahoochee-Flint River Basin lies in three distinct physiographic provinces, the Appalachian Highland, the Piedmont Plateau, and the Coastal Plain. In the first two named, numerous hills and mountains rise 2,500 to 3,000 feet above sea level. The Coastal Plain area, divided into Upper and Lower sections, is quite flat and soil is pervious. Swampy, heavily wooded valleys are typical of the Plain area.

Ground water supplies north of the Fall Line are obtained chiefly from weathered zones of crystalline rocks. Although not as productive as aquifers in the Coastal Plain region, the Piedmont and Blue Ridge (Appalachian Highland) ground water sources serve many municipalities and industries. One industry in Atlanta has continued to use more than 100,000 gpd from a dug well less than 100 feet deep. Springs are also a water source in this area.

In the Coastal Plain province there are three principal ground water aquifers: the Cretaceous sand extending from the Fall line to 50 miles south of it, further south the Paleocene and Eocene limestone and sand aquifer extending nearly to the Florida State line, and below this the principal limestone aquifer. Water under both artesian and water table conditions occurs in the Cretaceous aquifers, and wells range in depth from 250 to 1500 feet.

The Paleocene and Eocene aquifer also is found under artesian and water table conditions. Wells developed in this region range in depth from less than 50 feet to more than 100 feet, depending on the amount of water desired and the location and type of the wells. Water quality is good in most places although some of it is hard.

The principal limestone aquifer, most productive of all aquifers in the Basin, consists mainly of hydraulically connected limestone beds. These beds are up to 600 feet thick, but vary greatly in thickness, and are generally found at depths of 100 feet. Salt water encroachment occurs below depths of 1000 feet along the Gulf.

POPULATION

The population of the Apalachicola-Chattahoochee-Flint Basin is equal to approximately one-third of the total Southeast River Basins population. This is due primarily to the fact that Atlanta, Georgia with a 1960 Census metropolitan population in excess of one million persons is located within the watershed. Other than Atlanta, the two other Standard Metropolitan Statistical Areas in the Basin are Albany, Georgia, 1960 metropolitan population 75,680; and the Columbus, Georgia-Phenix City, Alabama, metropolitan population 217,985. Marietta and LaGrange, Georgia, with populations of 25,565 and 23,632 respectively, are the next largest municipalities.

According to Census data provided by the U. S. Study Commission, total Basin population in 1960 was 1,621,400, an increase of 19.4 percent over the 1950 population. Of this total 63.2 percent is urban and 36.8 percent rural. Typical of most of the country, rural populations decreased during the 1950-60 decade. The Study Commission estimates that Basin population in the year 2000 will be almost 4 million.

RESOURCES

The economy of the Apalachicola-Chattahoochee-Flint Basin is one of combined agriculture and industry. Leading income crops are peanuts and cotton followed by corn, peaches, pecans, truck crops, tobacco, hogs, and cattle. Poultry raising (broiler production) is the largest industry in the Chattahoochee headwaters area. Peach production is confined primarily to that portion of the Chattahoochee valley between Atlanta and the Alabama State line.

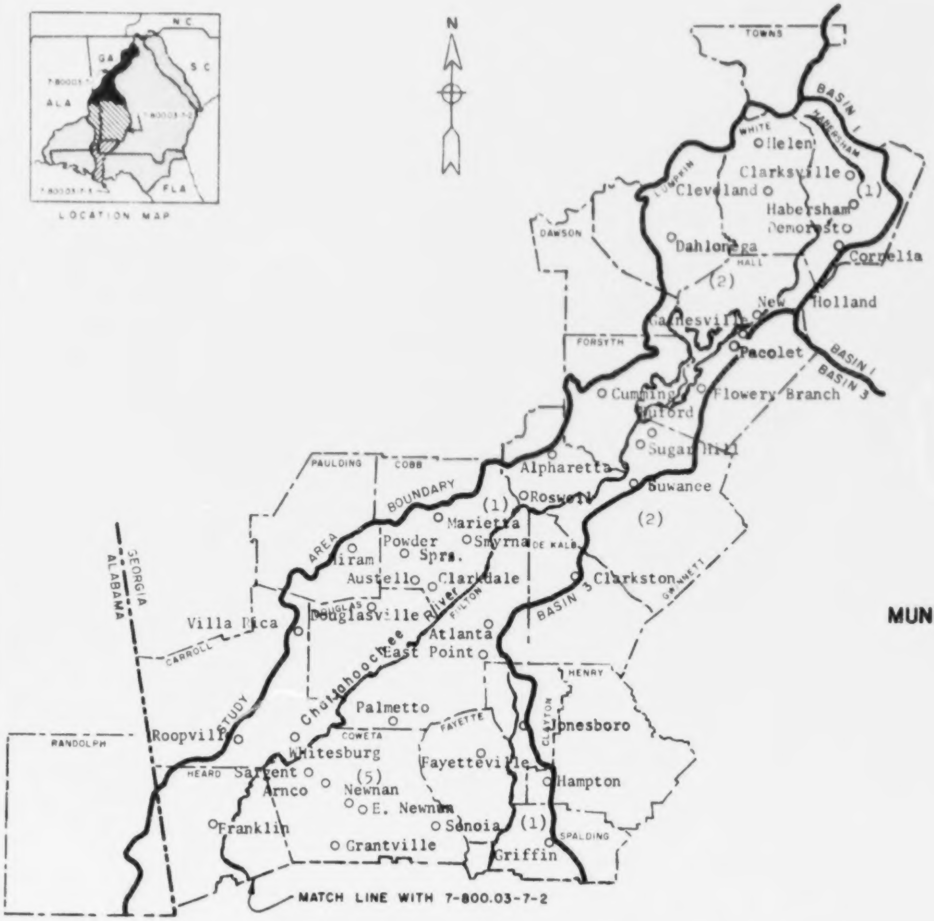
Major industrial activity in the Basin is located in Atlanta although textile mills are situated throughout the area. Atlanta is the chief trading and railroad center of the State of Georgia, and it supports a diversified industrial complex including automobile, aircraft, chemical, and food product manufacturers. Also important to the Basin are lumber and wood products, machinery, and fishing industries. Due to many attractive features of the area, including abundant water resources, industrialization is expected to increase in the future.

Recreational development in the Basin has expanded rapidly in the last few years. Annually thousands of persons visit Jim Woodruff and Sidney Lanier Reservoirs, and upon completion of other large Chattahoochee River Dams, recreational facilities will expand even more. A number of headwater streams in the northern mountains provide trout fishing.

W-1

MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES

W-1a



MUNICIPAL & INDUSTRIAL WATER SYSTEMS

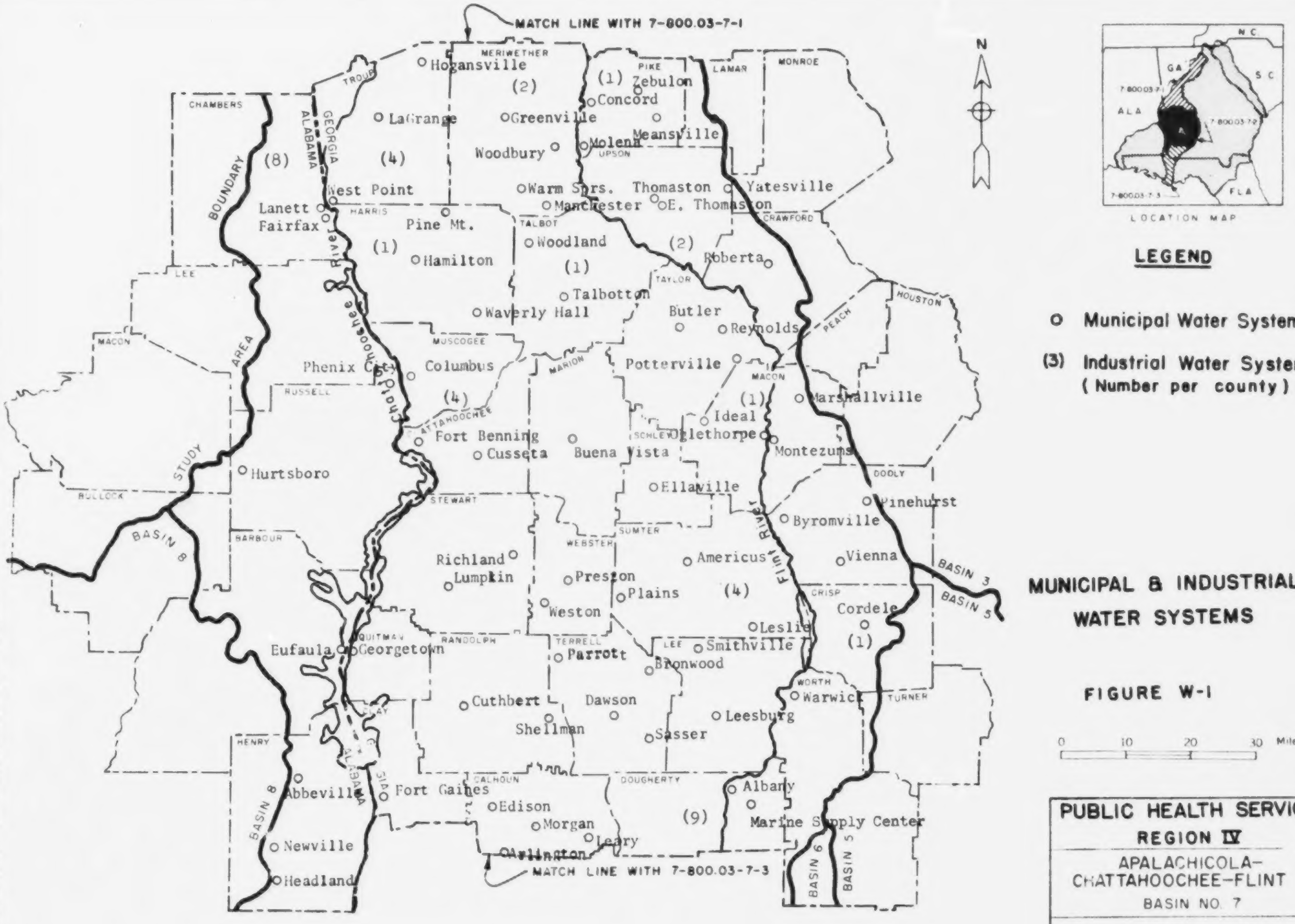
FIGURE W-1

SCALE

0 10 20 30 Miles

PUBLIC HEALTH SERVICE
REGION IV
APALACHICOLA-
CHATTAHOOCHEE-FLINT
BASIN NO. 7
JANUARY 1, 1960

W-1-b



LEGEND

- ○ Municipal Water System
- (3) Industrial Water Systems (Number per county)

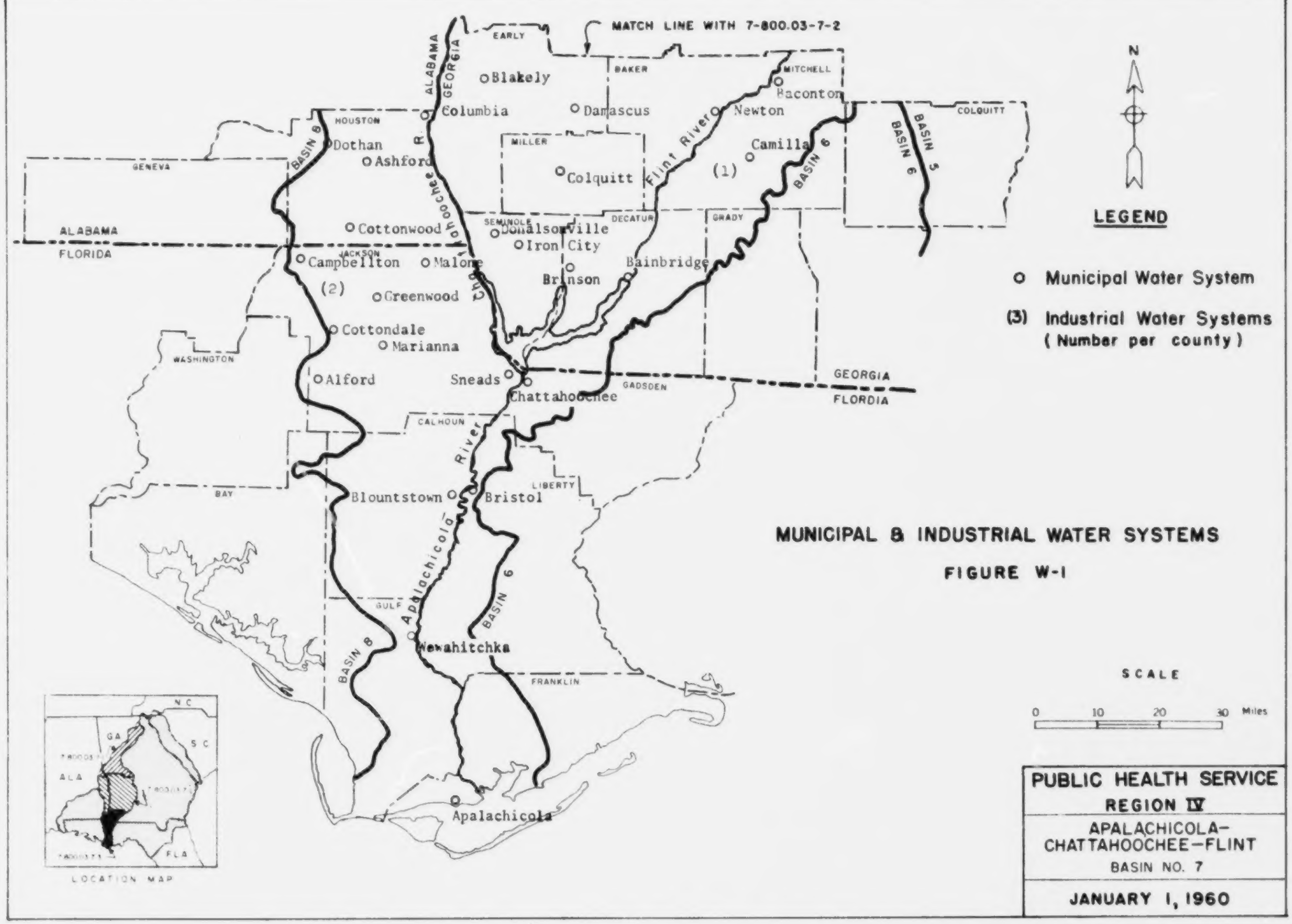
MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FIGURE W-1

PUBLIC HEALTH SERVICE
REGION IV
APALACHICOLA-CHATTAHOOCHEE-FLINT
BASIN NO. 7

JANUARY 1, 1960

W-1-C



MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FIGURE W-1

PUBLIC HEALTH SERVICE
REGION IV
APALACHICOLA-CHATTAHOOCHEE-FLINT
BASIN NO. 7
JANUARY 1, 1960

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal, industrial, and domestic water supply systems whose source of water is in the Apalachicola-Chattahoochee-Flint Basin. Although an attempt was made to collect data on semi-public water supplies, the amount of information available was not sufficient to warrant inclusion in this memorandum. Estimated future water requirements in the Basin for the years 1975 and 2000 are also presented, as are suggested solutions to present and anticipated future water supply inadequacies. In connection with these suggested solutions, an appraisal of the benefits to be derived and the annual costs of obtaining water are included.

This memorandum contains no data concerning water requirements of steam-electric generating stations located in the Basin.

PROCEDURES AND INVESTIGATIONS

Existing data on water demand and availability were obtained from reports, records, and correspondence of the Alabama State Department of Public Health, the Alabama Water Improvement Commission, the Alabama State Chamber of Commerce, the Florida State Board of Health, the Florida State Chamber of Commerce, the Georgia Department of Public Health, the Georgia State Chamber of Commerce, the Georgia Department of Commerce, the U. S. Department of Agriculture, and other Federal and State agencies. Where data were found to be lacking or out-dated, extensive field investigations were conducted by the Alabama Water Improvement Commission, the Florida State Board of Health, and the Georgia Department of Public Health. The data obtained were submitted to the Public Health Service for inclusion in this memorandum. The field investigations included visits to municipalities, small communities, industries, and institutions.

Data were obtained regarding the 151 municipal water supply systems in the Basin and carefully studied to establish both present and future water requirements and water supply needs.

Data on industrial water use were obtained from the municipalities furnishing the water, or when an industrially-owned water supply system was involved, from the industry itself. The location of municipal and industrial water supply systems is shown by Figure W-1.

Little information was available concerning the large number of existing domestic water supply systems. Because limited time and funds would not permit a complete inventory of all domestic water systems, a random sample survey of approximately 500 systems throughout the SERB area was made. The data thus obtained were analyzed and certain conclusions were drawn regarding the average number of persons served by each system, the percentages of the various types of wells and equipment, and the extent of improvements needed. These SERB area averages were applied to the Apalachicola-Chattahoochee-Flint Basin.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for communities not listed in census reports. Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960 modified by considerations of changing economic conditions. However, the population projections of urban areas (municipalities of 2500 or more) were adjusted to match projections made by the U. S. Study Commission.

For purposes of this memorandum, future municipal water demands were determined using projected urbanized area populations and estimated per capita water use. The 1975 needs were determined using a water demand of 100 gallons per capita per day (gpcd) in municipalities of under 1,000 persons and 150 gpcd in municipalities of 1,000 or more. The 2000 projections were based on a water demand of 150 gpcd in municipalities of less than 1,000 persons and 200 gpcd in municipalities of 1,000 or more.

The number of domestic water users was estimated for 1960, 1975, and 2000. This number was determined by obtaining the difference between the population within the Basin served by municipal water systems and the total population of the Basin. Future domestic water demand was estimated by using 70 gpcd in 1975 and 100 gpcd for 2000. A figure of 4.5 persons per system was used to determine the number of domestic water supply systems. All future systems were assumed to be pressurized.

Projections of industrial water system demands (for those industries receiving all or a portion of their supply from industrially-owned systems) were determined by assuming that water demands will increase or decrease in direct proportion to projected industrial growth or decline. In addition, several new industries are expected to locate in the Basin.

January 1, 1960 constant dollars were used for the purpose of estimating annual capital costs, annual operation and maintenance costs, and annual replacement costs of existing and needed water supply systems. An interest rate of 4¼ percent was used for determining annual costs for municipal, domestic, and industrial water supply systems.

Water supply system costs have been estimated on the basis of per capita cost data developed by the Public Health Service and adjusted to the January 1, 1960 Engineering News-Record Construction Cost Index for Atlanta, Georgia.

QUANTITY AND QUALITY OF WATER AVAILABLE FOR WATER SUPPLIES

SURFACE WATER

A description of the major streams in the Basin has been included in the INTRODUCTION of these memoranda. Discharges below

Lake Sidney Lanier on the Chattahoochee River are controlled by Buford Dam releases and re-regulated for water supply purposes at Atlanta by the Morgan Falls Dam. The Chattahoochee River is expected to be adequate to meet the water demand of the Atlanta metropolitan area through the year 2000.

The availability of surface water quality data in the Chattahoochee portion of the Basin is excellent. Some data are available in the Flint sub-basin but very little are available in the Apalachicola. Data have been collected at fifty-one stations; thirty-three on the Chattahoochee, fourteen on the Flint, and four on the Apalachicola. As the report Water Quality Basic Data-Southeast River Basins, 1961, prepared for the U. S. Study Commission by the Public Health Service shows, the average dissolved oxygen content at the sample stations consistently exceeded 75 percent of saturation and median coliform concentrations ranged from 15 to 4300 Most Probable Number (MPN) per ml with most values less than 1000 MPN per ml. Average hardness of the surface waters never exceeded 50 parts per million (ppm) and iron content which ranged from 0.0 to 0.18 ppm in the Chattahoochee and Flint sub-basins reached 0.54 ppm at one station on the Apalachicola. Dissolved solids concentration was generally less than 50 ppm.

To supplement existing surface water quality data, five sampling stations were established in the Basin by the Public Health Service; on the Chattahoochee near Franklin and West Point, Georgia, and on the Flint near Griffin, Montezuma, and Albany, Georgia. Field studies were conducted by the Public Health Service during November 1960, January, February, and June 1961. The water quality information obtained substantiated previous data reported and in addition showed that organic nitrogen content ranged from 0.30 to 0.52 ppm and total phosphate from 0.0 to 0.32 ppm.

GROUND WATER

Available ground water in the Basins is scarce in the Blue Ridge Province, somewhat more abundant in the Piedmont Province, and plentiful in the Coastal Plain. Yields of drilled municipal wells in the Piedmont Province vary widely and range from 10 to 200 gallons per minute (gpm) with an average of approximately 75 gpm. In the Coastal Plain Province, wells draw upon three aquifers: the Cretaceous, the Paleocene and Eocene, and the principal limestone. Yields in the coastal area vary from 100 to more than 2500 gpm with the greater amounts obtained from the principal limestone aquifer.

Chemical and physical analyses of ground water were available at 105 stations throughout the Basin as shown in the report: Water Quality Basic Data - Southeast River Basins, 1961. Generally, ground water is of such quality that little or no treatment would be necessary to comply with the chemical requirements of the Public Health Service "Drinking Water Standards." There are a few local areas in the Basin, however, where treatment would be necessary. In the Piedmont Province, available data indicate that isolated problems exist in almost every county due to high iron content, higher than 0.3 ppm, and in five counties due to low pH, less than 6.5. One station in Cobb County reported a high nitrate concentration of 11.2 ppm, possibly indicating contamination, and a sulfate content of 410 ppm was reported in Fayette County. High fluoride concentration was discovered in a well at Woodbury, Georgia.

In the Coastal Plain Province the only water quality problems appear to be occasional low pH and high iron values from sand aquifers and high dissolved solids content on the Gulf Coast, which indicates possible salt water intrusion. One well in Liberty County, Florida showed a high nitrate content of 70 ppm.

MUNICIPAL WATER SUPPLIES

INVENTORY

There are 151 municipal water systems whose source of water is within the Apalachicola-Chattahoochee-Flint Basin. These systems serve 1,635,930 persons in 184 communities and institutions. In addition there are 3 communities in the Basins served by systems whose source is outside the Apalachicola-Chattahoochee-Flint Basin. The 3 systems with "outside" sources are Clayton County in Georgia, and LaFayette and Roanoke in Alabama. The community of Port St. Joe, Florida which is located outside the Basin obtains its water supply from the Chipola River which is in the Apalachicola-Chattahoochee-Flint Basin. This community and two industries have been inadvertently omitted from the tables and summaries contained in this memorandum. However, data on the water supply for the Port St. Joe area can be found in the Choctawhatchee-Perdido Basin Technical Memoranda. Forty of the 151 water systems use surface water as the source of municipal supplies, five use both surface and ground water, and the remainder use water from wells only.

The total population of the Apalachicola-Chattahoochee-Flint Basin in 1960 was 1,621,400. The 151 water systems obtaining water from within the Basin served 1,635,930 persons of which 308,490 were located in the Altamaha Basin. The three systems in the Basin which obtain their water from "outside" sources serve 10,000 persons.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

The average water demand of the 151 municipal systems shown in Table W-1 is 199.174 mgd or 122 gpcd. Industries which depend on municipal systems for water supply consume 35.7 mgd or 18 percent of the total municipal system output.

Twenty-two of the municipal water supply systems are privately owned and 129 are publicly owned. All plants have periodic bacteriological examinations made of the water supplied to the public. Forty-one systems have filtration plants with chlorination, 21 have either iron removal or some type of chemical treatment with chlorination, and 28 provide chlorination only. The 61 remaining systems provide no treatment, although the supplies have proven bacteriologically satisfactory up to the present time without disinfection. Fifteen systems serving 480,390 persons provide fluoridation.

The only difficult treatment problem reported was for manganese removal at the DeKalb County Water Works. Undoubtedly other treatment problems exist, but they were not reported.

WATER SUPPLY SYSTEM REQUIREMENTS FOR 1960

Although 95 municipalities reported that improvements to their present water supplv systems were needed, a study of the basic data indicates that 106 of the water supply systems have source, treatment, storage, or distribution system inadequacies.

The recommended improvements, as shown by Table W-2, in terms of cost, include wells for 21 communities, disinfection for 62, iron removal for 2, storage facilities for 32, high service pumps for 4, plant enlargements for 9, and distribution system extensions serving 31,000 additional persons in 41 municipalities.

FUTURE WATER SUPPLY SYSTEM REQUIREMENTS

Table W-3 shows the projected municipal water demands for 1975. It is anticipated that most subdivisions shown in the 1960 inventory will have been incorporated into adjacent cities by 1975. The 134 municipal water systems in the Basin will have an estimated total water demand of 343.54 mgd and will serve an estimated 2,291,800 persons. Water supply system improvements in addition to those listed as being needed in 1960 will be required to adequately serve this population. A study of the basic data indicates that surface source facilities (impoundments, intakes, etc.) will be required in 7 municipalities, wells in 10, disinfection equipment in 14, treatment plant construction (new or additions to existing facilities) in 12, elevated storage in 26, and expansion of distribution systems to serve an estimated 665,000 persons in 126 commuities.

Table W-4 shows the projected municipal water demands for the year 2000. By the year 2000 the 128 municipal water systems obtaining water from sources within the Basin will serve an estimated population of 4,507,200 persons and the total water demand for this population is estimated to be 893.59 mgd. A study of the basic data indicates that additional improvements will be required between 1975 and 2000 in 19 surface source facilities, wells will be required in 35, disinfection equipment in 41, new treatment plant construction or addition in 32, elevated storage in 59, and expansion of distribution systems to serve an estimated population of 2,190,800 will be needed in 92 communities.

FUTURE WATER SUPPLY PROBLEMS

As indicated in the POLLUTION ABATEMENT memorandum, a substantial increase in pollutional effluent from the Atlanta area is expected to be discharged to the Chattahoochee and Flint Rivers by 1975 and 2000. The future effect of these discharges on downstream water uses which at the present time is considered serious can only be determined by a more detailed study, but it is very possible that the Griffin water supply system on the Flint will be detrimentally affected. Use of the Chattahoochee River in the future as a source of water for Newnan, Georgia may also prove inadvisable.

It is expected that some municipal water supply systems utilizing limited supply sources may be confronted with water shortages in the future. It is important that more detailed studies be made of currently available and alternate sources, and that satisfactory solutions to future water supply needs be forthcoming.

ANNUAL COSTS

The annual cost of providing water to municipal users in the Apalachicola-Chattahoochee-Flint Basin in 1960 is estimated to be $20,023,000. This cost, based on the cost of existing facilities, is broken down as follows:

Annual equivalent capital cost	$ 9,790,000
Annual replacement cost	148,000
Annual operation and maintenance cost	10,085,000
Total annual cost (1960)	$20,023,000

The total capital outlay required to improve the existing municipal water supply facilities in 1960 is estimated to be $14,622,000 as shown by Table W-2. The expenditure of this amount of money will strengthen the existing municipal water systems of the Basin and provide adequate service.

Between 1960 and 1975, additional expenditure will be necessary to improve water supply systems and meet the demands of the increased number of users. The capital cost of providing the additional necessary improvements by 1975 is estimated to be $54,884,000 as shown by Table W-3. This includes $6,475,000 for improvement of sources and treatment, $8,528,000 for storage facilities, and $39,881,000 for distribution facilities.

TABLE W-1

BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS

APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
ALABAMA									
Abbeville	2,524	2,520	wells	none	1.000	0.285	0.125	50	28
Ashford	1,511	2,000	wells	Dh	0.500	0.232	0.120	60	10
Columbia	783	1,000	wells	none	0.790	0.037	0.100	100	
Cottonwood	953	500	wells	none	0.570	0.050	0.030	60	0
Dothan	31,440	35,200	wells	DcVs	5.140	1.950	4.000	114	25
Eufaula	8,357	8,350	Barbour Creek well	CasDcFrsKpMbSbo none	1.080 0.720	1.360	0.500	60	15
Eufaula Air Force Station	undet	undet	well	none	0.100	0.070	0.012	--	0
Fairfax (unincorp.)	3,107	4,000	Chat R	CasMtbSbFrsDcKp	2.000	undet	0.320	80	
Headland	2,650	2,800	well	none	0.430	0.065	0.200	71	40
Hurtsboro	1,056	1,040	wells	AcClFpsDh	0.192	0.139	0.064	60	0
LaFayette	(obtains water outside Basin 7)								
Lanett	7,674	18,530	Chatt R	DcCasFrsKcpMb SbVs	3.300	0.890	1.860	100	10
Newville	546	500	well	none	0.095	0.050	0.030	60	0
Phenix City	27,630	26,500	Chatt R	CalDcFrsKpMpt Sbo	4.000	2.400	1.600	60	10
Roanoke	(obtains water outside Basin 7)								
FLORIDA									
Alford	380	375	wells	none	0.118	none	0.050	135	0
Apalachicola	3,099	3,090	wells	AsScDc	1.152	0.155	0.260	80	10
Blountstown	2,375	2,500	wells	none	0.778	0.060	0.200	84	0
Bristol	614	497	wells	none	0.216	none	0.045	90	0
Campbellton	309	350	wells	none	0.216	0.030	0.040	125	0
Chattahoochee	9,699	3,676	wells	Dc	1.123	0.300	0.200	55	9
State Hospital	--	7,300	Mosquito Cr	DcAtCalMtSo FrsKp	3.750	1.700	2.150	295	0
Cottondale	849	950	wells	none	0.173	0.050	0.100	100	0
Greenwood (unincorp.)	400	105	wells	none	0.020	none	0.010	100	0
Malone	661	676	wells	none	0.518	0.075	0.070	100	0
Marianna	7,152	7,135	wells	CalSbcFrsDc (2 wells) and Dh (2 wells)	3.456	0.215	0.630	90	0
Florida School for Boys (1/23/62)	--	950	wells	Dc	0.792	0.075	0.250	260	10

W-8

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
FLORIDA - Cont'd									
Sneads	1,399	1,355	wells	Dh	0.144	0.060	0.110	80	0
Apalachee Correct. Inst.	--	600	wells	Dc	2.016	0.100	0.200	330	10
Hospital Prision Farm	--	235	well	none	1.440	0.030	0.030	133	0
Wewahitchka	1,436	945	wells	Dh	0.324	0.080	0.100	105	0
GEORGIA									
Albany[2]	55,890	61,300	wells	DcVs	24.000	1.000	6.521	107	29
Fairfield S/D	200	175	well	Dh	0.335	0.001	0.010	60	0
Kalmoh-Malone S/D	1,250	1,250	wells	Dh	1.150	0.010	0.075	60	0
Radium Springs S/D	875	998	wells	Dc	2.000	0.125	0.060	60	0
Alpharetta	1,349	1,420	wells	none	0.250	0.055	0.200	140	0
Americus	13,472	13,872	wells	Dc	4.000	0.450	1.750	125	0
Arlington	1,462	1,400	wells	none	1.300	0.045	0.085	60	0
Arnco Village (unincorp.)	1,000	800	wells	none	0.550	0.090	0.030	35	0
Atlanta[3]	--	609,500	Chatt R	CalMbSobTcNDc FprsKp(Hemphill Plant) DcMtCal MpSmFrsKpNTc (Chatta.Plant)	92.000	23.665	73.742	121	18
Austell	1,867	2,267	Sweetwater Cr	DcCasMbSoFrs	0.500	0.260	0.365	160	25
Baconton	564	550	well	Dh	undet.	0.030	0.021	38	10
Bainbridge	12,714	10,210	wells	Dc	9.400	0.246	1.500	145	4
Blakely	3,580	5,100	wells	none	2.600	0.500	0.800	157	10
Brinson	248	275	wells	none	undet.	0.010	0.019	69	
Bronwood	400	400	wells	none	0.360	0.065	0.037	93	
Buena Vista	1,574	1,870	wells	AtClDc	0.980	0.165	0.193	104	55
Buford[4]	4,168	4,768	Lake Lanier	CalMpSboKpFrsDc	0.520	0.400	0.383	80	2
Butler	1,346	1,546	wells	none	0.500	0.112	0.067	43	
Byromville	349	384	wells	CsFpsDh	0.090	0.050	0.030	78	
Camilla	4,753	4,813	wells	Dc	6.000	0.220	1.000	208	70
Clarkdale (unincorp.)	440	440	Sweetwater Cr	CalsDcMbsFrsKp	0.500	0.180	0.067	152	59
Clarkston	1,524	1,408	wells	none	4.500	0.075	0.130	92	0

(1/23/62)

W-10

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
GEORGIA - Cont'd									
Clarkesville	1,352	2,052	Soque R	CalDcMbSoFrsKp	0.360	0.402	0.182	89	27
Cleveland	657	1,157	wells	Dh	0.500	0.065	0.080	69	
Cobb County-Marietta Water Authority[5]	--	80,000	Chatt R	SoDcCalSoFrs KpVs	16.000	7.275	8.687	109	
Colquitt	1,556	1,520	wells	none	0.650	0.075	0.090	60	
Columbus	116,779	139,279	Chatt R	SCalDcMbSo FrsKp	36.000	17.400	16.310	117	18
Concord	333	365	Ward Spring	Dh	0.177	0.065	0.015	41	
Cordele	10,609	11,309	wells	DcVs	5.600	0.240	1.000	88	10
Cornelia	2,936	3,536	Little Hazel Cr and wells	CalDcMbFrScVt	0.900	0.500	0.600	170	46
Cumming	1,561	1,680	Suwannee Cr	CalDcTcMbSo FrsKp	0.720	0.553	0.460	274	81
Cussetta	768	794	well	KpMtFapADh	0.170	0.094	0.046	60	
Cuthbert	4,300	4,380	wells	none	1.800	0.375	0.450	103	5
Dahlonega	2,604	2,550	Yahoola Cr. and Crown Springs	CalMbSoFrsDc	0.140	0.320	0.150	59	47
Damascus	297	300	wells	none	2.150	0.010	0.018	60	
Dawson	5,062	5,100	wells	none	1.750	0.955	0.350	69	10
DeKalb County[6]	--	163,700	Chatt R	CalDcTcMcpS FrKpVsVo	33.000	8.330	33.000	121	7
Demorest	1,029	1,829	wells	Dc	0.160	0.096	0.100	55	2
Donalsonville	2,621	2,535	wells	Dc	0.575	0.165	0.250	100	5
Paradise Acres S/D	105	105	wells	none	0.040	0.001	0.008	75	0
Douglas County	--	4,350	Anneewakee Cr	CalMbSoFrsDc	2.500	0.600	0.600	100	
Douglasville	4,462	4,462	Jones L and Arrington L	CalDcMbSoFrsKp	0.750	0.780	0.450	100	10
East Newman[7] (unincorp.)	1,874	650	well	none	undet	0.075	0.018	28	
East Point	35,633	68,229	Sweetwater Cr	CaDcMtbSoTc FaTdKp	8.000	3.750	6.720	99	42

(1/23/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand		Percent Used by Industry
							mgd	gpcd	
GEORGIA - Cont'd									
East Thomaston	2,237	2,300	Potato Cr	CasMpSoFrsDc NgKp	3.000	0.750	2.990	1300	87
Edison	1,232	1,230	wells	none	1.440	0.120	0.150	122	0
Ellaville	905	955	wells	AsClMbScFrs	0.155	0.144	0.065	68	1
Fayetteville	1,389	1,415	Ginger Cake Cr	CaDcIMbSoFrs Kp	0.144	0.185	0.075	53	
Flowery Branch	741	800	wells	none	0.080	0.060	0.040	50	14
Fort Benning	--	80,000	Upatoi Cr	filtration	8.000	5.450	5.400		
Fort Gaines	1,314	1,380	wells	none	0.720	0.300	0.138	100	
Franklin	603	610	wells	Fp	0.240	0.070	0.061	100	2
Gainesville[8]	16,253	30,953	L Lanier	DcCalMtpSo FrsKpVtDc	6.000	3.010	3.700	120	62
Georgetown	554	550	well	none	0.186	0.075	0.030	60	37
Grantville	1,158	1,183	wells	none	0.370	0.125	0.100	92	5
Greenville	726	1,320	Town Branch Cr	CalMbSoFrsDc	0.200	0.255	0.100	76	
Griffin	--	22,000	Flint R.	CalTcDcMbSo FrasVt	7.000	4.300	4.300	195	55
Gwinnett County[9]	--	19,253	Chatt R	CalTcMptSoFrs Dc	6.500	4.300	1.636	80	
Habersham (unincorp.)	370	370	springs	CalDcMbSoFrs	0.144	0.075	0.020	54	
Hamilton	396	396	Br of Palmetto Cr	DcClMbSoFrsKp	0.100	0.067	0.017	43	
Hampton	1,253	1,210	wells	Dh·	0.160	0.100	0.120	100	21
Helen	227	225	well & springs	Fsg	0.086	0.175	0.013	60	
Hiram	358	358	well	Dh	0.130	0.075	0.013	36	
Hogansville	3,658	3,894	Flat Cr	DcCaMbSobFrs KpVs	0.600	0.700	0.400	103	
Ideal	432	357	well	ActFrsFzDh	0.100	0.100	0.012	33	
Iron City	298	298	wells	none	0.065	0.005	0.030	100	
Jonesboro[10]	3,014	3,054	wells	Dh	0.250	0.325	0.099	54	

(1/23/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
GEORGIA - Cont'd									
LaGrange	23,632	25,132	Chatt R	DcCaTcMbSo FrsKpVs	4.000	2.500	1.950	77	29
Leary	848	840	well	none	0.420	0.020	0.050	60	
Leesburg	774	750	wells	none	0.930	0.050	0.075	100	10
Leslie	494	494	wells	none	0.144	0.060	0.030	60	
Lumpkin	1,348	1,350	wells	AClKcDhSo	0.430	0.165	0.075	55	0
Manchester	4,115	4,315	springs	CalDcMbSoFrs KpVt	1.000	0.400	0.417	97	17
Scenic Hts. S/D	150	150	well	Dh	0.030	0.004	0.009	60	0
Marine Corps Supply Center	2,593	2,593	wells	KpDc	6.630	1.000	0.870	--	
Marshallville	1,308	1,308	wells	AcCl	0.720	1.044	0.065	50	5
Meansville	335	212	wells	none	0.087	0.001	0.008	38	
Molena	279	284	wells	none	0.087	0.006	0.10	35	
Montezuma	3,744	3,744	wells	AtDcCalMbSo FrsVs	2.500	0.435	0.500	135	8
Morgan	293	290	wells	none	0.722	0.070	0.017	60	0
New Holland (unincorp.)	1,570	1,150	spring	Dc	0.360	0.200	0.100	87	40
Newman	12,169	12,169	White Oak Cr & Glover Cr	CalTcKaNcMbSo FrsDcVo	3.000	2.300	1.200	98	61
Newton	529	529	well	none	1.000	0.038	0.038	72	
Oglethorpe	1,168	1,150	wells	AtClDc	0.420	0.060	0.050	43	
Pacolet (unincorp.)	630	630	wells	Dh	0.210	0.145	0.063	100	50
Palmetto	1,446	1,486	Big Cedar Cr	DcCaMbSoFrsKp	0.400	0.160	0.060	40	
Parrott	280	280	well	none	0.144	0.040	0.040	143	0
Pinehurst	257	462	well	none	0.144	0.050	0.018	39	
Pine Mountain	790	930	spring	none	0.100	0.100	0.044	47	
Pine Mountain Valley (unincorp.)	600	600	spring & well	none	undet	0.100	0.140	230	78
Plains	572	615	wells	CsFpaAmDh	0.072	0.050	0.037	60	
Potterville (unincorp.)	150	150	wells	none	0.200	0.001	0.001	67	
Powder Springs	746	1,722	well	none	0.650	0.060	0.085	50	5
Preston	232	250	well	none	0.180	0.075	0.025	100	0

(1/23/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand		Percent Used by Industry
							mgd	gpcd	
GEORGIA - Cont'd									
Reynolds	1,087	1,127	well	none	0.360	0.140	0.055	49	
Richland	1,472	1,460	wells	DcCs	0.722	0.230	0.200	137	0
Roberta	714	690	wells	none	0.096	0.060	0.041	60	
Roopville	203	212	well	none	0.050	0.012	0.002	60	
Roswell	2,983	3,983	Big Creek	CaIMbSoFrsDc	0.700	0.625	0.300	75	
Sargent (unincorp.)	1,500	800	wells	Dh	0.200	0.253	0.035	44	
Sasser	382	388	wells	none	0 300	0.035	0.030	78	0
Senoia	782	500	wells	none	0.230	0 075	0.030	60	5
Shellman	1,050	1,190	wells	none	undet	0.125	0.071	60	0
Smithville	723	700	wells	KcDh	0.220	0.130	0.042	60	
Sugar Hill[11]	1,175	1,175	wells	Dh	0.070	0.060	0.050	43	
Suwannee	541	450	well	none	0.110	0.060	0.018	33	
Talbotton	1,163	1,223	wells	none	0.175	0.100	0.054	44	2
Thomaston	9,336	9,340		TcCaIMbSoFrs KpDc	2.000	0.800	1.000	107	10
Subdivisions - four	2,200	1,800	wells	none	undet	0.005	0.100	56	
Vienna	2,099	2,119	wells	Dc	2.400	0 075	0.212	100	
Villa Rica	3,450	2,472	Burnt Mill Cr	CaIsMbSoFrs KpDc	1.500	2.050	0.350	140	
Warm Springs	538	650	Cold Springs	CsDhMiFz	2.600	0.100	0.040	62	
Warm Springs Foundation	350	350	Warm Springs	CMpstSvFzDc	0.320	0.250	0.160	460	
Warwick	434	449	well	none	0.200	0.030	0.040	90	
Waverly Hall	712	690	wells	ACsFrsDh	0.090	0.075	0.042	60	
Weston	120	50	well	none	0.070	0.004	0.003	60	
West Point	4,610	4,610	Oseligee Cr & Chatt R	DcCaMbSoFaVs Kpc	2.180	1.280	0.552	120	7
Whitesburg	366	541	wells	none	undet	0.050	0.025	68	
Woodbury	1,230	1,230	spring	Dh	0.150	0.240	0.070	57	7

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand		Percent Used by Industry
							mgd	gpcd	
GEORGIA - Cont'd									
Woodland	720	720	well	Dh	0.100	0.060	0.018	25	
Yatesville	354	354	wells	none	0.110	0.050	0.010	28	
Zebulon	563	653	well & Elkins Cr	DcCaTcMbSo FrsKp	0.500	0.152	0.054	83	30
Totals		1,635,929					199.174	122	18 (35.724 mgd)

---

[1] Serves adjacent areas including Langdale, Shawmut, and Riverview.

[2] Serves Turner Air Force Base.

[3] Serves adjacent areas including Fairburn, Forest Park, Hapeville, Union City, Fort McPherson, and Atlanta General Depot.

[4] Serves Rest Haven.

[5] Serves Acworth, Kennesaw, Marietta, Smyrna, and Dobbins Air Force Base.

[6] Serves Avondale Estates, Chamblee, Decatur, Doraville, North Atlanta, and Pine Lake.

[7] Serves College Park.

[8] Serves adjacent areas including Chicopee and Clermont.

[9] Serves Berkeley Lake, Dacula, Duluth, Norcross, Lawrenceville (0.167 mgd), Loganville, and Lilburn.

[10] Also served by the Clayton County Water System (0.066 mgd).

[11] Water demand supplemented during summer with 0.200 mg/mo from Gwinnett Co. Water Co.

(1/23/62)

TABLE W-2
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Estimated Costs in $1,000				
Municipality	**Source**	**Treatment**	**Storage**	**Dist. System**	**Total**
ALABAMA					
Abbeville	12	8	70	156	246
Ashford	12	--	--	78	90
Columbia	--	--	70	28	98
Cottonwood	12	2	70	117	201
Dothan	48	--	272	446	766
Eufaula	24	--	--	156	180
Eufaula Air Force Station	--	2	--	--	2
Headland	12	8	70	117	207
Hurtsboro	12	--	--	78	90
Lanett	20	526	272	550	1368
Newville	12	2	--	78	92
Phenix City	--	--	--	131	131
FLORIDA					
Alford	--	2	27	68	97
Blountstown	--	8	--	--	8
Bristol	12	2	41	132	187
Campbellton	--	2	--	39	41
Chattahoochee	--	--	--	4	4
Cottondale	6	2	--	--	8
Greenwood	1	2	--	18	21
Malone	--	2	--	--	2
Marianna	--	--	58	--	58
Sneads	2	--	--	66	68
Wewahitchka	14	8	52	146	220
White City (no system at present)	24	2	27	42	95
GEORGIA					
Albany	--	--	272	--	272
Kalmoh-Malone S/D	12	--	18	--	30
Alpharetta	--	8	--	--	8
Americus	--	975	--	--	975
Arlington	--	8	--	--	8
Arnco Village	12	8	--	--	20
Atlanta	--	--	--	1500	1500

(1/23/62)

TABLE W-2 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Estimated Costs in $1,000				
Municipality	Source	Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd					
Austell	--	--	250	--	250
Baconton	12	--	--	--	12
Bainbridge	--	--	90	150	240
Blakely	--	8	--	--	8
Brinson	--	2	--	--	2
Bronwood	12	2	--	--	14
Buena Vista	5	--	58	--	63
Buford	--	115	132	--	247
Butler	--	8	--	--	8
Camilla	--	--	48	--	48
Clarkesville	--	212	--	--	212
Cleveland	--	--	70	--	70
Cobb County - Marietta Water Authority	--	--	--	790	790
Colquitt	12	--	41	--	53
Columbus	--	--	70	--	70
Cordele	--	--	82	--	82
Cornelia	--	212	100	--	312
Cuthbert	--	--	--	19	19
Dawson	--	8	--	--	8
DeKalb County	--	1000	816	522	2338
Demorest	12	--	--	--	12
Donalsonville	18	--	--	--	18
Paradise Acres S/D	--	2	--	--	2
Douglas County	--	--	48	123	171
East Newnan	12	8	--	72	92
East Thomaston	--	--	202	--	202
Ellaville	--	22	--	--	22
Fayetteville	--	--	--	20	20
Flowery Branch	--	2	--	--	2
Fort Gaines	--	8	--	--	8
Franklin	--	4	--	--	4
Gainesville	--	660	--	--	660
Georgetown	--	2	--	58	60
Grantville	--	8	--	--	8
Griffin	--	380	--	--	380
Helen	12	2	--	--	14

(1/23/62)

TABLE W-2 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Costs in $1,000				
	Source	Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd					
Iron City	--	2	--	--	2
Leary	--	2	--	--	2
Leesburg	--	2	--	--	2
Leslie	--	2	--	--	2
Lumpkin	--	2	--	19	21
Manchester	--	--	48	--	48
Marshallville	12	8	--	19	39
Meansville	--	2	--	6	8
Molena	--	2	--	--	2
Morgan	--	2	--	--	2
New Holland	--	--	--	24	24
Newnan	--	--	272	12	284
Newton	--	2	--	--	2
Parrott	--	2	--	--	2
Pinehurst	--	2	--	--	2
Pine Mountain	--	2	--	--	2
Pine Mountain Valley	--	2	--	--	2
Plains	--	12	--	--	12
Pottersville	--	2	--	--	2
Powder Springs	--	2	--	--	2
Preston	--	2	--	50	52
Reynolds	--	8	--	--	8
Roberta	--	8	60	18	86
Roopville	--	2	--	--	2
Sargent	--	2	--	42	44
Sasser	--	2	--	--	2
Senoia	--	2	--	17	19
Shellman	--	8	--	--	8
Suwannee	--	2	--	--	2
Talbotton	--	8	--	--	8
Thomaston	--	--	48	--	48
Subdivisions - four	12	8	48	--	68
Vienna	--	--	58	--	58
Villa Rica	--	--	--	60	60
Warwick	--	2	--	--	2
Waverly Hall	--	--	--	39	39

(1/23/62)

TABLE W-2 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Estimated Costs in $1,000				
Municipality	Source	Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd					
Weston	--	2	--	4	6
Whitesburg	--	2	--	--	2
Yatesville	--	2	--	--	2
Zebulon	--	--	--	30	30
Totals	366	4,352	3,860	6,044	14,622

*Based on 1960 constant dollar values.

(1/23/62)

TABLE W-3
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA						
Abbeville	2,800	0.420	--	--	18	18
Ashford	2,200	0.330	--	--	12	12
Columbia	900	0.090	--	--	--	--
Cottonwood	1,450	0.217	--	--	30	30
Dothan	42,000	6.300	24	--	408	432
Eufaula	10,000	1.500	20	--	99	119
Fairfax	4,000	0.600	--	--	--	--
Headland	3,100	0.470	--	--	18	18
Hurtsboro	1,150	0.172	--	--	7	7
Lanett [1]	19,000	2.850	--	--	--	--
Newville	560	0.560	--	--	4	4
Phenix City	37,000	5.550	450	--	600	1,050
FLORIDA						
Alford	500	0.068	--	--	8	8
Apalachicola	2,700	0.405	--	--	--	--
Blountstown	2,700	0.405	--	70	12	82
Bristol	614	0.061	--	--	--	--

(1/23/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA - Cont'd						
Campbellton	300	0.040	--	--	--	--
Chattahoochee	4,100	0.615	--	48	24	72
State Hospital	7,300	2.150	--	--	--	--
Cottondale	1,050	0.157	--	--	6	6
Greenwood	400	0.040	12	25	--	37
Malone	835	0.083	--	--	10	10
Marianna	9,400	1.410	--	90	138	228
Florida School for Boys	950	0.250	24	--	--	24
Sneads	2,100	0.315	12	45	45	102
Apalachee Correct. Inst.	600	0.200	--	--	39	39
Hopital Prision Farm	235	0.030	2	--	--	2
Wewahitchka	1,850	0.277	--	--	54	54
White City	700	0.070	--	--	--	--
GEORGIA						
Albany [2]	88,600	13.300	--	958	1,630	2,588
Americus	19,000	2.865	--	132	312	444

(1/23/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Arlington	1,600	0.240	--	35	12	47
Arnco Village	1,000	0.150	--	--	--	--
Atlanta [3]	949,000	142.000	4,100	4,500	16,600	25,200
Baconton	600	0.060	--	--	3	3
Bainbridge	20,700	3.100	--	132	480	612
Blakely	6,000	0.900	--	--	54	54
Brinson	225	0.022	--	--	--	--
Bronwood	350	0.035	--	--	--	--
Buena Vista	2,200	0.330	--	--	18	18
Buford [4]	6,600	0.990	212	--	108	320
Butler	1,700	0.255	--	--	9	9
Byromville	390	0.039	--	--	--	--
Camilla	8,300	1.730	--	90	210	300
Clarkesville	3,000	0.450	121	--	60	181
Cleveland	1,200	0.180	--	--	--	--
Cobb Co. Water Auth.[5]	102,100	15.300	--	404	300	704
Colquitt	2,100	0.315	--	--	36	36
Columbus	234,900	35.200	--	--	5,700	5,700
Concord	300	0.030	--	--	--	--

(1/23/62)

W-21

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Cordele	15,000	2.250	--	132	222	354
Cornelia	4,700	0.800	--	--	72	72
Cumming	2,400	0.650	--	--	43	43
Cusseta	1,150	0.172	--	--	21	21
Cuthbert	5,600	0.840	8	--	72	80
Dahlonega	5,000	0.750	223	--	150	373
Damascas	250	0.025	--	--	--	--
Dawson	6,600	0.990	--	--	90	90
DeKalb County [6]	297,000	44.500	--	1,100	7,250	8,350
Demorest	1,900	0.285	24	--	--	24
Donalsonville	4,400	0.660	12	70	114	196
Douglas County	13,500	2.000	--	--	550	550
Douglasville	7,000	1.050	121	--	150	271
East Newnan	2,900	0.435	24	48	60	132
East Thomaston	2,400	3.120	212	--	6	218
Edison	1,200	0.180	--	--	--	--
Ellaville	1,000	0.150	--	--	--	--
Fayetteville	1,800	0.234	136	48	28	212
Flowery Branch	1,000	0.150	--	--	12	12

(1/23/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000 Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Fort Benning	80,000	5.400	--	--	--	--
Fort Gaines	2,400	0.360	--	--	60	60
Franklin	850	0.085	--	--	14	14
Gainesville [7]	40,000	6.000	--	272	540	812
Georgetown	700	0.070	--	--	9	9
Grantville	1,000	0.150	--	--	--	--
Greenville	1,400	0.210	10	--	5	15
Griffin	30,400	5.900	15	--	505	520
Gwinnett County [8]	40,800	6.100	--	--	1,020	1,020
Habersham	370	0.037	--	--	--	--
Hamilton	350	0.035	--	--	--	--
Hampton	1,500	0.225	36	--	18	54
Helen	250	0.225	--	--	2	2
Hiram	400	0.040	--	--	3	3
Hogansville	5,100	0.765	223	--	72	295
Ideal	530	0.053	--	--	10	10
Iron City	305	0.030	00	18	--	18
LaGrange	29,000	4.350	212	--	240	452
Leary	1,050	0.157	--	27	12	39

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Leesburg	880	0.088	--	--	8	8
Leslie	500	0.050	--	--	--	--
Lumpkin	1,700	0.255	--	--	27	27
Manchester	4,900	0.735	--	70	36	106
Marine Corps Supply Cntr.	2,593	0.870	--	--	--	--
Marshallville	1,550	0.232	--	--	15	15
Meansville	470	0.047	--	18	15	33
Molena	250	0.025	--	--	--	--
Montezuma	5,500	0.825	--	--	108	108
Morgan	315	0.031	--	--	--	--
New Holland	1,570	0.235	--	--	--	--
Newnan	19,100	2.900	--	70	420	490
Newton	535	0.053	--	--	--	--
Oglethorpe	1,270	0.190	--	--	7	7
Pacolet	630	0.063	--	--	--	--
Parrott	240	0.030	--	--	--	--
Pinehurst	425	0.042	--	--	--	--
Pine Mountain	930	0.093	--	--	--	--
Pine Mountain Valley	600	0.140	--	--	--	--

(1/23/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Plains	600	0.060	--	--	--	--
Pottersville	150	0.015	--	18	--	18
Preston	200	0.020	--	--	--	--
Reynolds	1,400	0.210	--	--	18	18
Richland	1,400	0.210	--	--	--	--
Roberta	900	0.090	--	--	12	12
Roopville	200	0.020	--	--	--	--
Sargent	1,500	0.225	12	--	--	12
Sasser	395	0.039	--	--	--	--
Senoia	805	0.080	--	--	1	1
Shellman	1,000	0.150	--	--	--	--
Smithville	830	0.083	--	--	8	8
Talbotton	1,300	0.195	12	--	5	17
Thomaston	14,600	2.200	212	90	310	612
Vienna	2,250	0.338	--	--	9	9
Villa Rica	6,400	0.960	--	--	240	240
Warm Springs	700	0.070	--	--	3	3
Warm Springs Foundation	350	0.160	--	--	--	--

(1/23/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Warwick	465	0.046	--	--	--	--
Waverly Hall	850	0.085	--	--	10	10
Weston	100	0.010	--	--	3	3
West Point	7,600	1.140	--	--	180	180
Whitesburg	600	0.060	--	--	3	3
Woodbury	1,470	0.220	6	18	14	38
Woodland	900	0.090	--	--	12	12
Yatesville	400	0.040	--	--	3	3
Zebulon	650	0.065	--	--	--	--
Totals	2,291,837	343.544	6,475	8,528	39,881	54,884

*Based on 1960 constant dollar values.

(1) Serves Langdale, Shawmut, and Riverview.
(2) Serves Turner Air Force Base.
(3) Serves total urban population of Fulton County and Atlanta portion of DeKalb County.
(4) Serves Rest Haven and Sugar Hill.
(5) Serves total urban population of Cobb County.
(6) Serves total urban population of DeKalb County, excluding Atlanta portion.
(7) Serves Chicopee and Clermont.
(8) Serves total urban population of Gwinnett County, excluding Buford, Rest Haven, and Sugar Hill.

(1/23/62)

TABLE W-4
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA						
Abbeville	3,200	0.640	--	--	24	24
Ashford	2,600	0.520	--	--	24	24
Columbia	500	0.075	--	--	--	--
Cottonwood	2,600	0.520	--	--	75	75
Dothan	68,000	13.600	216	544	1,560	2,320
Eufaula	17,200	3.440	44	--	432	476
Fairfax	4,700	0.940	--	--	42	42
Headland	3,900	0.780	24	--	50	74
Hurtsboro	1,350	0.270	--	--	12	12
Lanett	29,000	5.800	223	--	600	823
Newville	570	0.085	--	--	--	--
Phenix City	61,000	12.200	1,020	544	1,440	3,004
FLORIDA						
Alford	780	0.117	12	27	17	56
Apalachicola	2,000	0.400	--	--	--	--
Blountstown	3,100	0.620	--	--	24	24
Bristol	614	0.092	--	--	--	--
Campbellton	250	0.037	--	--	--	--

(1/23/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA - Cont'd						
Chattahoochee	9,500	1.900	32	132	324	488
State Hospital	7,300	2.150	--	--	--	--
Cottondale	1,500	0.300	12	35	27	74
Eastpoint	1,000	0.200	32	41	60	133
Greenwood	400	0.060	--	--	--	--
Malone	1,225	0.245	--	--	24	24
Marianna	16,700	3.340	20	272	438	730
Florida School for Boys	950	0.250	--	--	--	--
Sneads	3,400	0.680	12	48	78	138
Apalachee Correctional Institution	600	0.200	--	--	--	--
Hospital Prison Farm	235	0.030	--	--	--	--
Wewahitchka	2,300	0.460	14	41	27	82
White City	700	0.105	--	--	--	--
GEORGIA						
Albany [2]	192,000	38.400	196	1,900	6,200	8,296
Americus	71,200	14.240	1,620	1,090	3,120	5,830
Arlington	1,800	0.360	--	35	12	47

(1/23/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Arnco Village	1,000	0.200	--	--	--	--
Atlanta[3]	1,634,300	327.000	21,200	11,000	41,000	73,200
Baconton	670	0.101	--	--	4	4
Bainbridge	86,000	17.200	112	1,090	3,900	5,102
Blakely	12,600	2.520	--	90	396	486
Bronwood	200	0.030	--	--	--	--
Buena Vista	4,000	0.800	--	48	108	156
Buford[4]	9,000	1.800	212	--	144	356
Butler	3,500	0.700	12	70	108	190
Byromville	390	0.058	--	--	--	--
Camilla	24,800	4.960	--	404	990	1,394
Clarksville	5,800	1.160	115	--	168	283
Cleveland	1,200	0.240	--	27	--	27
Cobb County Water Auth.[5]	274,500	55.000	4,000	3,200	10,000	17,200
Colquitt	6,000	1.200	14	82	234	330
Columbus	365,400	73.000	7,850	4,000	7,830	19,680
Concord	225	0.045	--	--	--	--
Cordele	31,900	6.380	32	404	1,020	1,456
Cornelia	11,900	2.380	126	90	432	648

(1/23/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Cumming	8,300	1.660	223	48	354	625
Cusseta	3,100	0.620	139	48	117	304
Cuthbert	10,500	2.100	12	110	300	422
Dahlonega	18,000	3.600	676	272	780	1,728
Dawson	12,400	2.480	20	82	348	450
DeKalb County[6]	722,000	144.500	15,150	7,500	25,500	48,150
Demorest	2,900	0.580	56	48	66	170
Donalsonville	9,000	1.800	80	132	276	488
Douglas County	26,900	5.400	544	272	805	1,621
Douglasville	17,800	3.560	463	202	650	1,315
East Newnan	7,000	1.400	68	82	246	396
East Thomaston	4,400	3.120	--	--	120	120
Edison	1,000	0.200	--	--	--	--
Ellaville	1,100	0.220	34	--	6	40
Fayetteville	3,500	0.700	10	48	102	160
Flowery Branch	1,600	0.320	--	30	36	66
Fort Benning (Army)	80,000	5.400	--	--	--	--
Fort Gaines	5,800	1.160	24	--	204	228
Franklin	1,450	0.290	14	27	36	77

(1/23/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Gainesville [7]	65,900	13.180	795	676	1,560	3,031
Georgetown	1,000	0.200	12	--	18	30
Grantville	750	0.112	--	--	--	--
Greenville	1,400	0.280	--	27	--	27
Griffin	60,000	12.000	526	--	1,800	2,326
Gwinnett County [8]	189,000	37.800	3,090	2,500	8,900	14,490
Habersham	370	0.055	--	--	--	--
Hamilton	275	0.041	--	--	--	--
Hampton	2,600	0.520	80	48	66	194
Helen	300	0.045	--	--	3	3
Hiram	450	0.067	--	--	3	3
Hogansville	11,000	2.200	223	82	360	665
Ideal	750	0.112	22	--	13	35
Iron City	315	0.047	--	--	1	1
LaGrange	60,000	12.000	1,020	776	1,860	3,656
Leary	1,600	0.320	--	35	33	68
Leesburg	900	0.135	--	--	1	1
Leslie	525	0.079	--	--	2	2
Lumpkin	3,500	0.700	87	35	108	230

(1/23/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Manchester	10,000	2.000	218	110	306	634
Marine Corps Supply Center	2,600	0.870	--	--	--	--
Marshallville	2,700	0.540	--	--	72	72
Meansville	830	0.124	12	30	24	66
Montezuma	11,900	2.380	--	132	384	516
Morgan	360	0.054	--	--	3	3
New Holland	1,570	0.314	--	--	--	--
Newnan	48,500	9.700	970	544	1,760	3,274
Newton	550	0.082	--	--	1	1
Oglethorpe	1,450	0.290	--	35	11	46
Pacolet	630	0.094	--	--	--	--
Pinehurst	375	0.046	--	--	--	--
Pine Mountain	930	0.140	6	--	--	6
Pine Mountain Valley	600	0.090	--	--	--	--
Plains	670	0.101	--	--	--	--
Pottersville	150	0.023	--	--	--	--
Reynolds	1,900	0.380	12	41	30	83
Richland	1,200	0.240	--	--	--	--
Roberta	1,325	0.264	12	27	26	65

(1/23/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Sargent	1,500	0.300	--	--	--	--
Sasser	420	0.063	--	--	2	2
Senoia	850	0.127	--	--	3	3
Shellman	800	0.120	--	--	--	--
Smithville	1,025	0.205	--	25	12	37
Talbotton	1,310	0.262	12	--	--	12
Thomaston	37,000	7.400	794	544	1,380	2,718
Vienna	3,000	0.600	--	--	45	45
Villa Rica	20,700	4.140	671	202	840	1,713
Warm Springs	800	0.120	--	--	6	6
Warm Springs Foundation	350	0.160	--	--	--	--
Warwick	515	0.077	--	--	4	4
Waverly Hall	1,100	0.220	77	--	15	92
West Point	21,500	4.300	537	132	840	1,509
Whitesburg	800	0.120	--	--	12	12
Woodbury	1,900	0.380	2	41	26	69
Woodland	1,300	0.260	12	27	24	63
Yatesville	480	0.072	--	--	5	5

(1/23/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Zebulon	650	0.098	--	--	--	--
Totals	4,507,184	893.589	63,853	40,184	131,449	235,486

*Based on 1960 constant dollars.
(1) Serves Langdale, Shawmut, and Riverview.
(2) Serves Turner Air Force Base.
(3) Serves total urban population of Fulton County and Atlanta portion of DeKalb County.
(4) Serves Rest Haven and Sugar Hill.
(5) Serves total urban population of Cobb County.
(6) Serves total urban population of DeKalb County, excluding Atlanta portion.
(7) Serves Chicopee and Clermont.
(8) Serves total urban population of Gwinnett County, excluding Buford, Rest Haven, and Sugar Hill.

(1/23/62)

The annual cost of providing water to municipal users in 1975 is estimated to be $30,785,300. This includes annual equivalent capital cost of: (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on total investment as of 1975, and the operation and maintenance cost is based on the total installed systems as of 1975. A breakdown of this annual cost is given below.

Annual equivalent capital cost	$13,158,500
Annual replacement cost	168,800
Annual operation and maintenance cost	17,458,000
Total annual cost (1975)	$30,785,300

Between 1975 and 2000, municipal growth will make necessary an additional estimated capital expenditure of $235,486,000 to raise the water supply facilities to the necessary capacity. This includes $63,853,000 for source improvement and treatment facilities, $40,184,000 for storage capacity, and $131,449,000 for extension of distribution facilities.

The annual cost of providing water to municipal users by 2000 is estimated to be $70,115,900 assuming that all needs have been met by the year 2000. A breakdown of this annual cost is given below:

Annual equivalent capital cost	$24,593,700
Annual replacement cost	223,200
Annual operation and maintenance cost	45,299,000
Total annual cost (2000)	$70,115,900

BENEFITS

Storage for municipal water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obtained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

Because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the future, from public or private sources in the Basin, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established is estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for municipal use included in any multi-purpose project constructed in the Basin would be at least equal to the cost of developing alternative sources.

DOMESTIC WATER SUPPLIES

INVENTORY

The methods for obtaining basic data on domestic water supply systems have been outlined previously in the section PROCEDURES AND INVESTIGATIONS.

The number of persons in the Basin served by existing municipal water supply systems is estimated to be 1,337,440. The remainder of the Basin population of 283,960 persons is served by domestic water supply systems. Average per capita water demand is 50 gallons per day which indicates a total existing domestic water demand of 14.2 mgd.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Based on the analysis of the SERB area wide random-sample survey of domestic supplies, it is estimated that there are 63,100 domestic water supply systems in the Apalachicola-Chattahoochee-Flint Basin. Of this total, 21,900 systems are drilled wells, 30,500 are dug wells, 3,300 bored wells, 4,000 driven wells, and 3,400 are springs.

It is estimated that 5,170 systems have an insufficient source of supply and another 20,000 have sources of improper construction. There are 46,000 supplies which have pressure systems and of the remaining 17,100 supplies, 3,000 use hand pumps and 14,100 use buckets. There are 38,800 systems which do not meet accepted health standards and 16,700 systems have water quality problems, the most significant of which are hardness and high iron concentrations.

WATER SUPPLY SYSTEM REQUIREMENTS FOR 1960

In order to provide a safe, potable supply of water for human consumption, certain minimum improvements will be needed for many of the existing domestic systems. These improvements consist of development of new sources for those systems which have either insufficient yield or sources of improper construction. Systems which presently use hand pumps or buckets should install pressure systems and those systems which do not meet health standards because of improper construction will need seals and covers. Softening or other treatment of those sources which have water quality problems is also needed. In addition, approximately 31,000 persons now served by domestic systems should connect to municipal water supply systems. Costs for providing these needs are listed below.

Total capital outlay to improve existing domestic water supply systems to accepted health standards is estimated to be $28,100,000. This includes $11,600,000 for development of new sources, $2,220,000 for sanitary seals and covers, $7,750,000 for pressure systems, $5,020,000 for treatment facilities, and $1,510,000 for complete new systems.

FUTURE WATER SYSTEM REQUIREMENTS

In determining future requirements it was assumed that all domestic water supply systems in the future will be pressurized and will meet accepted health standards. By 1975, it is estimated that a total of 86,100 domestic systems serving 387,400 persons will be in existence in the Apalachicola-Chattahoochee-Flint Basin. This will require construction of 23,300 complete new systems (wells, seals and covers, pressurization) and treatment for about 27 percent of the systems. Total cost of the new systems is estimated to be $29,953,000 based on 1960 constant dollars. This cost includes $28,028,000 for wells, seals and covers, and pressure systems and $1,925,000 for treatment facilities.

By 2000, an estimated 368,700 persons will be served by a total of 82,000 domestic water supply systems. This represents a decrease in population served by domestic systems which will results in the abandonment of 4,100 systems between 1975 and 2000.

Average domestic water demand by 1975 will be 27.1 mgd, based on 70 gpcd and in 2000 it will be 36.9 mgd based on 100 gpcd.

ANNUAL COSTS

For the purposes of this memorandum it is assumed that present and future needs of the domestic water systems will be met on an individual basis.

The annual cost of providing domestic water from existing systems is estimated to be $4,139,300. Based on an estimated existing capital investment of $50,130,000, the breakdown of annual costs for 1960 is as follows:

Annual equivalent capital cost	$2,434,300
Annual replacement cost	1,150,000
Annual operation and maintenance cost	555,000
Total annual cost (1960)	$4,139,300

The annual cost of providing water for domestic water supply systems in 1975 is estimated to be $8,975,200 based on an estimated total investment of $108,183,000. The breakdown of annual costs for 1975 is as follows:

Annual equivalent capital cost	$5,253,400
Annual replacement cost	2,488,900
Annual operation and maintenance cost	1,232,900
Total annual cost (1975)	$8,975,200

The annual cost of providing water from the domestic systems expected to exist in 2000 is estimated to be $9,626,800. The breakdown of annual costs for the year 2000 is as follows:

Annual equivalent capital cost	$5,662,800
Annual replacement cost	2,682,000
Annual operation and maintenance cost	1,322,000
Total annual cost (2000)	$9,626,800

INDUSTRIAL WATER SUPPLIES

INVENTORY

Data secured by field surveys of 52 industrially-owned water systems are shown in Table W-5. Only those industries with their own source of water were surveyed, although 18 of the industries shown in Table W-5 supplement their supplies with water from municipal water systems. As stated in the section, MUNICIPAL WATER SUPPLIES, information on two industries in the Port St. Joe area can be found in the Technical Memoranda on the Choctawhatchee-Perdido Basin. The 52 industries surveyed use 23.69 mgd from their own sources, and the total amount of water supplied to all industries by municipal systems is 35.7 mgd. Thus, the total industrial water use in the Basin is approximately 59.4 mgd. The textile industry is the largest user of water. Twenty-three of the 52 industries surveyed were textile plants and they use 15.85 mgd or 67% of the total water demand. The four largest textile plants account for 10.19 mgd or 43% of the total water demand.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Twenty-two of the industries surveyed obtain water (not including that from municipal systems) from surface sources only, 26 obtain water from wells only, and 4 obtain water from both wells and surface sources. The total use from wells is 8.29 mgd and the total use from surface sources is 15.40 mgd. No industry reported that the existing source of water was inadequate to meet demands.

Four of the industries provide disinfection only and 16 others provide complete treatment for water used for drinking and sanitation. One softens the water, and 1 industry treats for corrosion control. Fourteen industries reported treatment of water used for processing and boiler use. Process and boiler water was softened at 8 of the plants, 20 of the plants used complete treatment, and 2 treated for corrosion control. Three plants disinfected water used for processing. Twenty-four plants reported treating water for cooling. Seventeen plants used complete treatment for cooling water, 3 softened, 1 treated for corrosion control, and 4 used disinfection only.

FUTURE WATER SUPPLY REQUIREMENTS FOR 1975 AND 2000

Industrial water use from industrially owned sources by 1975 and 2000 is estimated to be 47.71 mgd and 56.17 mgd respectively. Table W-6 gives the projected water demands and water system needs (in terms of cost) for 1975 and 2000.

Between 1960 and 1975, industrial water supply system needs for existing and new plants will include installation of 10 wells, 2 surface water intakes, 8 chlorinators, and 3 storage facilities.

Industrial development will have expanded between 1975 and 2000 to the point that water supply system needs will include 15 new wells, 1 intake enlargement, 2 storage facilities, and 4 chlorinators.

FUTURE WATER SUPPLY PROBLEMS

No significant industrial water supply problems, from the standpoint of quantity and quality, are expected in the future. The major portion of water supplied to industry is obtained from municipal systems and this trend is expected to continue into the future.

ANNUAL COSTS

Existing industrial water supply systems are reported to be adequate for 1960 needs. The annual cost of providing industrial water in 1960 from existing supplies is estimated to be $1,076,000. A breakdown of this cost, based on the cost of existing facilities, is given below:

Annual equivalent capital cost	$ 279,000
Annual replacement cost	20,000
Annual operation and maintenance cost	777,000
Total annual cost (1960)	$1,076,000

The annual cost of providing the industrial water required by 1975 is estimated to be $1,502,000. This includes annual equivalent capital costs of existing facilities in 1960, and facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on the total investment as of 1975, and the operation and maintenance cost is based on the total installed systems as of 1975. A breakdown of these costs is given below:

Annual equivalent capital cost	$ 315,000
Annual replacement cost	25,000
Annual operation and maintenance cost	1,162,000
Total annual cost (1975)	$1,502,000

The annual cost of providing the industrial water needed by 2000 is estimated to be $1,683,000, assuming that all the needs have been met by the year 2000. A breakdown of this cost is given below:

TABLE W-5

BASIC DATA ON INDUSTRIAL WATER SUPPLY SYSTEMS

APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Type of Industry	Number of Employees	Drinking and Sanitation			Processing and Boiler			Cooling			Total Plant Demand mgd
				Source	Treatment	Average mgd	Source	Treatment	Average mgd	Source	Treatment	Average mgd	
ALABAMA													
Chambers	A	textile	1,902	Chattahoochee River	filter & chlor	0.050	Chattahoochee River	filter & chlor	1.290	recirculation	none	*	1.340
	B	textile	703	Chattahoochee River	filter & chlor	0.015	Chattahoochee River	filter & chlor	4.000	Chattahoochee River	filter & chlor	0.100	4.115
	C	textile	1,825	Chattahoochee River	filter & chlor	0.131	Chattahoochee River	filter & chlor	0.148	Chattahoochee River	filter & chlor	0.051	0.330
	D	textile	1,180	Chattahoochee River	filter & chlor	0.089	Chattahoochee River	filter & chlor	0.460	recirculation	none	*	0.549
	E	textile	140	Chattahoochee River	filter & chlor	0.004	Chattahoochee River	filter & chlor	0.063	Chattahoochee River	filter & chlor	0.003	0.070
	F	textile	400	Chattahoochee River	filter & chlor	0.039	Chattahoochee River	filter & chlor	0.002	Chattahoochee River	filter & chlor	0.066	0.107
	G	textile	673	Chattahoochee River	filter & chlor	0.083	Chattahoochee River	filter & chlor	0.148	Chattahoochee River	filter & chlor	0.040	0.271
	H	textile	130	Chattahoochee River	filter & chlor	0.020	Chattahoochee River	filter & chlor	0.007	Chattahoochee River	filter & chlor	0.007	0.034
FLORIDA													
Jackson	A	rendering	14	wells	none	0.001	well	pH adjust	0.001	Chipola R	none	undet	undet
	B	fertilizer	50	wells	none	0.001	wells	none	0.288	wells	none	0.864	1.153
GEORGIA													
Cobb	B	paper	125	city	--	--	pond & city	soften	*	pond & city	soften	*	0.475
Coweta	D	meat packing	90	city	--	--	city & wells	none	*	wells	none	*	0.548
	E	textile	350	city	--	--	Messiers Cr	filtration & chlor	0.238	Messiers Cr	filtration & chlor	0.012	0.250
	F	metal	700	city	--	--	city & well	none	0.023	well	none	0.063	0.086
	G	textile	600	well	chlor	undet	Wahoo Cr	chlor	0.210	well	chlor	0.006	0.216
	H	textile	625	well	none	0.100	Wahoo Cr	none	0.150	well	none	0.005	0.255
Crisp	J	fertilizer	20	city	--	--	well	none	*	well	none	*	0.024
Dougherty	K	chemical	14	well	none	*	well	none	*	--	--	--	0.216
	L	rendering	6	well	none	*	well	soften	*	Flint R	none	0.003	0.004
	M	fertilizer	80	well	none	*	well	none	*	well	none	*	0.520
	N	ice	5	well	soften & filter	*	well	soften & filter	*	well	soften & filter	*	1.000
	O	dairy	35	city	--	--	city & well	soften	*	well	none	*	0.576
	P	meat packing	14	well	none	*	well	none	*	well	none	*	0.003
	Q	dairy	10	well	none	*	well	none	*	well	none	*	0.039
	S	fertilizer	12	well	none	*	well	none	*	--	--	--	0.035

(1/23/62)

TABLE W-5 (CONT'D)
BASIC DATA ON INDUSTRIAL WATER SUPPLY SYSTEMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Type of Industry	Number of Employees	Drinking and Sanitation			Processing and Boiler			Cooling			Total Plant Demand mgd
				Source	Treatment	Average mgd	Source	Treatment	Average mgd	Source	Treatment	Average mgd	
GEORGIA - Cont'd													
Dougherty	U	pharmaceutical	70	well	chlor	*	well	chlor & soften	*	well	chlor	*	1.368
Gwinnett	V	rendering	42	city	--	--	city	--	--	Ivy Cr	none	0.137	0.137
	W	tannery	225	city	--	--	Suwannee Cr	filter & chlor	0.455	Suwannee Cr	filter & chlor	0.001	0.456
Habersham	Z	textile	225	spring	filter	0.005	spring	filter	undet	spring	filter	undet	undet
Hall	BB	textile	750	surface	filter & chlor	0.009	surface	filter & chlor	0.189	surface	filter & chlor	0.066	0.264
	CC	textile	1,300	spring	chlor	0.006	wells & spring	soften	0.047	well	none	0.016	0.069
Harris	DD	pump station	20	well	filter	*	well	filter	*	well	filter	*	0.028
Macon	GG	canning	400	well	undet	*	well	undet	*	well	undet	*	0.500
Meriwether	KK	canning	75	city	--	--	well	chlor	*	well	chlor	*	0.100
Mitchell	PP	fertilizer	50	city	--	--	city	--	--	well	none	0.101	0.101
Muscogee	QQ	textile	1,466	city	--	--	Chattahoochee River	filter & chlor	1.448	Chattahoochee River	filter & chlor	0.280	1.728
	RR	textile	1,066	city	--	--	Chattahoochee River	filter & chlor	1.925	Chattahoochee River	filter & chlor	0.075	2.000
	SS	fertilizer	66	city	--	--	city	--	--	Bull Cr	none	0.240	0.240
	TT	textile	1,050	city	--	--	Chattahoochee River	filter & chlor	0.092	Chattahoochee River	filter & chlor	0.010	0.102
Pike	AAA	canning	200	well	none	*	well	none	*	--	--	--	0.050
Spalding	PPP	canning	100	city	--	--	city	--	--	well	none	0.001	0.001
Sumpter	CCC	fertilizer	40	city	--	--	well	none	*	well	none	*	0.060
	DDD	meat packing	7	well	none	--	well	none	*	well	none	*	0.040
	EEE	canning	41	well	none	*	well	none	*	well	none	*	0.075
	FFF	wood preserving	35	well	pH adjust	*	well	pH adjust	*	well	pH adjust	*	0.003
Talbot	GGG	textile	7	city	--	--	city & well	soften	*	--	--	--	0.002
Troup	HHH	textile	600	Chattahoochee	filter & chlor	0.046	Chattahoochee River	filter & chlor	0.430	--	--	--	0.476
	III	textile	1,050	city	--	--	well	soften	0.089	well	soften	0.089	0.178
	JJJ	textile	1,000	well	chlor	*	well	chlor	*	well	chlor	*	0.150
	KKK	textile	1,500	Chattahoochee River	filter & chlor	0.087	Chattahoochee River	filter & chlor	0.808	--	--	--	0.895
Upson	LLL	textile	2,150	Potato Cr	filter & chlor	0.100	Potato Cr	filter & chlor	2.000	Potato Cr	filter & chlor	0.250	2.350
	MMM	textile	1,860	Potato Cr	filter & chlor	0.003	Potato Cr	filter & chlor	0.001	Potato Cr	filter & chlor	0.096	0.100
												Total	23.690

*Breakdown of water use not available. See last column for total demand.

(1/23/62)

TABLE W-6
INDUSTRIAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Estimated 1975 Requirements		Estimated 2000 Requirements	
		mgd	Costs	mgd	Costs
ALABAMA					
Chambers	A	1.320	--	1.100	--
	B	4.050	--	3.350	--
	C	0.325	--	0.270	--
	D	0.540	--	0.450	--
	E	0.070	--	0.060	--
	F	0.105	--	0.090	--
	G	0.265	--	0.220	--
	H	0.035	--	0.036	--
FLORIDA					
Jackson	A	0.005	--	0.005	--
	B	2.300	24,000	3.500	24,000
	New	0.100	43,000	0.160	--
GEORGIA					
Cobb	B	0.475	--	0.475	--
Coweta	D	0.850	12,000	1.370	24,000
	E	0.235	--	0.205	--
	F	0.158	--	0.425	12,000
	G	0.210	--	0.175	--
	H	0.250	--	0.210	--
Crisp	J	0.042	--	0.060	--
Dougherty	K	0.400	12,000	0.620	12,000
	L	0.010	--	0.010	--
	M	0.980	12,000	1.460	24,000
	N	1.000	--	1.000	--
	O	0.910	14,000	1.490	14,000
	P	0.005	--	0.010	--
	Q	0.060	2,000	0.100	--
	S	0.065	--	0.100	--
	U	2.540	32,000	3.800	32,000
Early	New	20.000	558,000	25.000	100,000
Gwinnett	V	0.245	--	0.360	--
	W	0.490	--	0.610	--
Habersham	Z	0.005	--	0.005	--
Hall	BB	0.255	--	0.215	--

(1/23/62)

TABLE W-6 (CONT'D)
INDUSTRIAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Estimated 1975 Requirements		Estimated 2000 Requirements	
		mgd	Costs	mgd	Costs
GEORGIA - Cont'd					
Hall	CC	0.070	--	0.070	--
Harris	DD	0.030	--	0.030	--
Macon	GG	0.780	14,000	1.250	14,000
Meriwether	KK	0.154	14,000	0.250	14,000
Mitchell	PP	0.190	--	0.280	--
Muscogee	QQ	1.690	--	1.420	--
	RR	1.950	--	1.650	--
	SS	0.450	--	0.670	--
	TT	0.100	--	0.090	--
Pike	AAA	0.080	2,000	0.125	--
Spaulding	PPP	0.002	--	0.003	--
Sumter	CCC	0.115	--	0.170	--
	DDD	0.055	2,000	0.090	12,000
	EEE	0.120	2,000	0.190	14,000
	FFF	0.005	--	0.005	--
Talbot	GGG	0.002	--	0.002	--
Troup	HHH	0.465	--	0.380	--
	III	0.173	--	0.145	--
	JJJ	0.145	--	0.120	--
	KKK	0.870	--	0.730	--
Upson	LLL	2.300	--	1.920	--
	MMM	0.100	--	0.080	--
Total		47.711	$743,000	56.166	$296,000

*Based on 1960 constant dollar values.

(1/23/62)

Annual equivalent capital cost	$ 329,000
Annual replacement cost	28,000
Annual operation and maintenance cost	1,326,000
Total annual cost (2000)	$1,638,000

BENEFITS

Storage for industrial water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obtained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

Because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the future, from public or private sources in the Basin, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established is estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for industrial use included in any multi-purpose project constructed in the Basin would be at least equal to the cost of developing alternative sources.

SUMMARY

1960

The total average water demand of existing (1960) municipal, domestic, and industrial water systems whose source is within the Apalachicola-Chattahoochee-Flint Basin is estimated to be 237.1 mgd. There are 151 municipal water systems (serving 1,635,930 persons) an estimated 63,100 domestic water systems (serving 283,960 persons) and 52 industrially-owned water systems. The total annual cost of providing water for municipal, domestic, and industrial uses is estimated to be $25,328,300.

1975

By 1975, the total average water demand of municipal, domestic, and industrial water systems whose source of water is within the Basin is estimated to be 418.4 mgd. The municipal water systems will serve 2,291,800 persons and there will be an estimated 86,100 domestic water systems serving 387,400 persons. The total annual cost of providing water for municipal, domestic, and industrial uses is estimated to be $41,262,500 by 1975.

2000

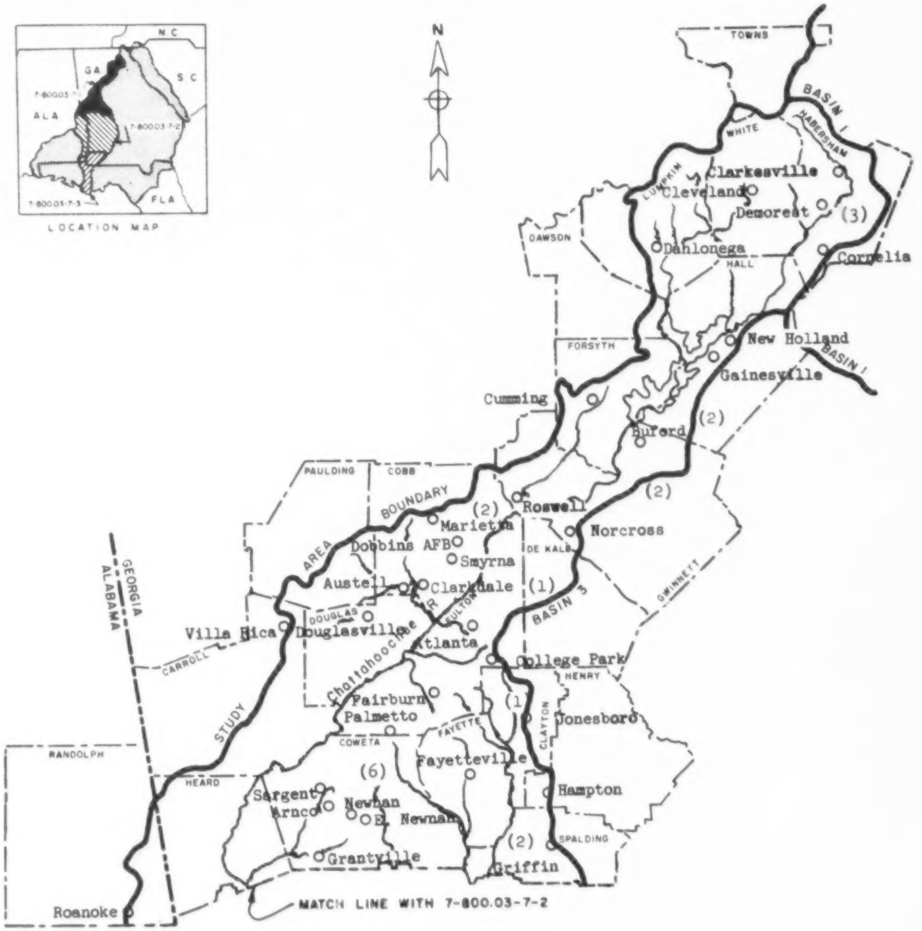
By the year 2000, the total average water demand of municipal, domestic, and industrial water systems whose source of water is within the Basin is estimated to be 986.7 mgd. The municipal water systems will serve 4,507,200 and there will be an estimated 82,000 domestic water systems serving 368,700 persons. The total annual cost of providing water for municipal, domestic, and industrial water uses is estimated to be $81,425,700 by the year 2000.

Water supply sources in the Apalachicola-Chattahoochee-Flint Basin are expected to be adequate to meet demands by the year 2000 if they are properly developed. Abatement of existing and possible future water pollution problems will be needed to protect water consumers.

P-1

POLLUTION ABATEMENT

P-1-a



LEGEND

○ Municipal Source

(3) Industrial Sources
(Number per county)

SOURCES OF POLLUTION

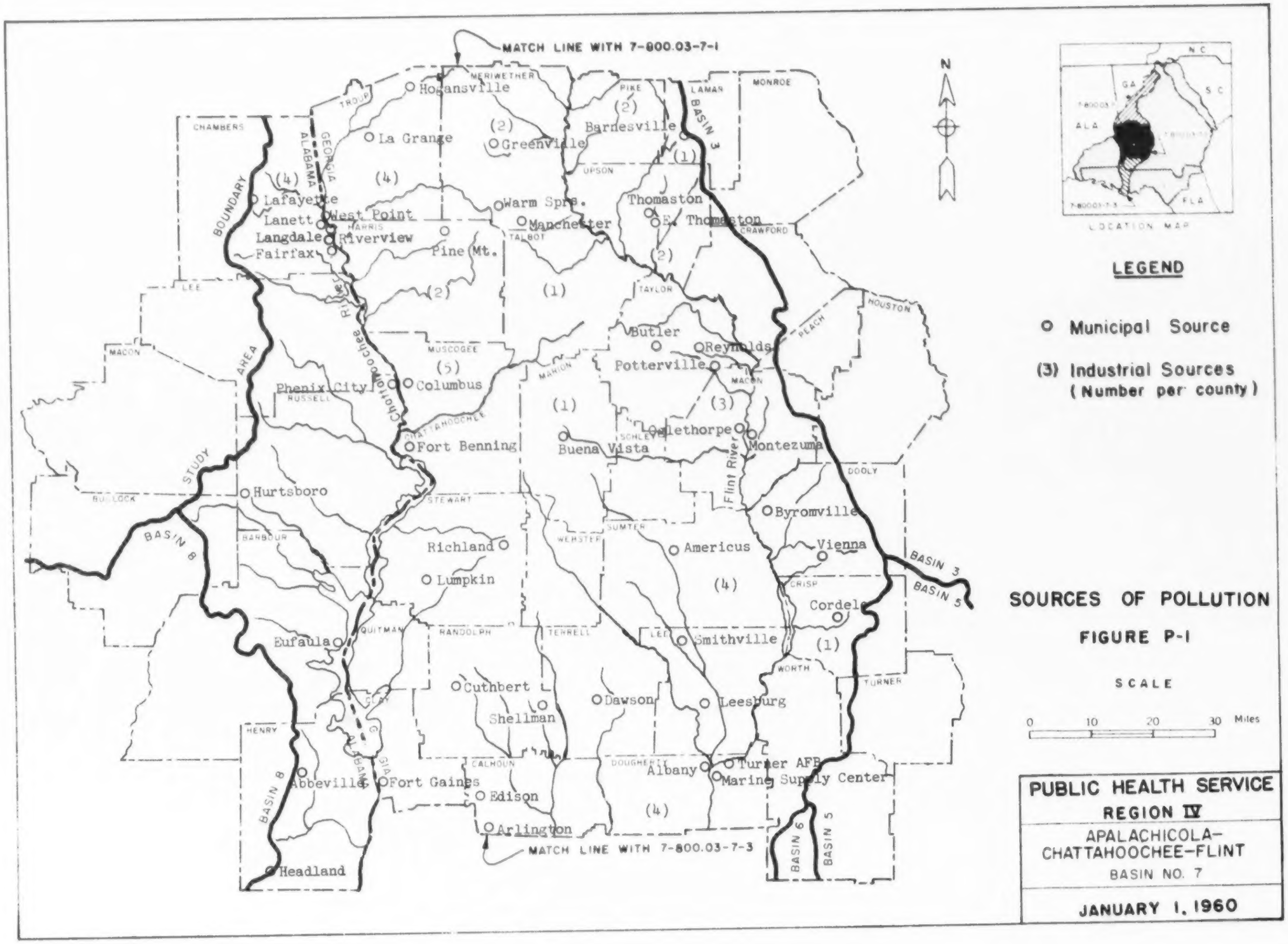
FIGURE P-1

SCALE

0 10 20 30 Miles

PUBLIC HEALTH SERVICE
REGION IV
APALACHICOLA-
CHATTAHOOCHEE-FLINT
BASIN NO. 7
JANUARY 1, 1960

P-1-b



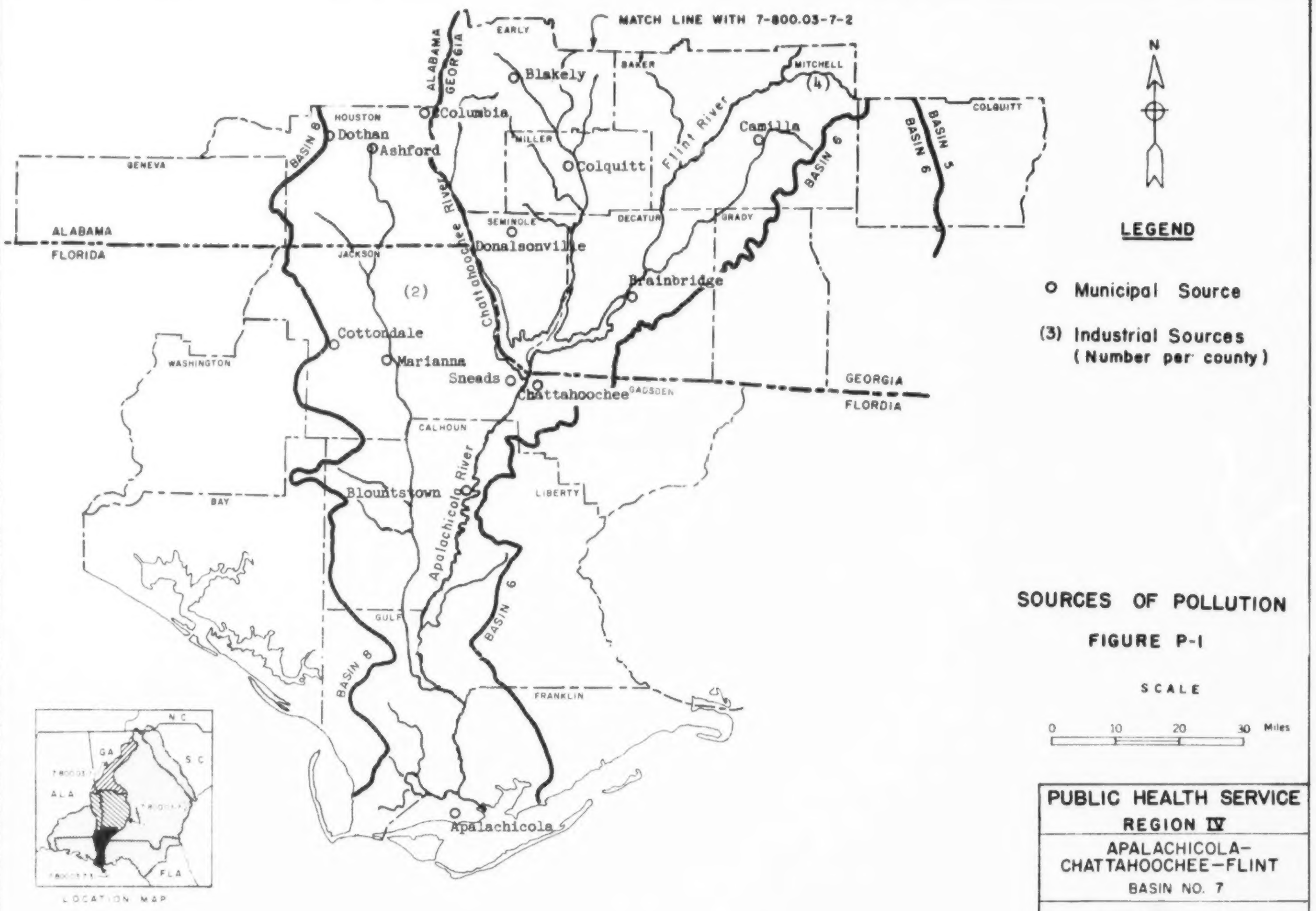
SOURCES OF POLLUTION

FIGURE P-1

PUBLIC HEALTH SERVICE
REGION IV
APALACHICOLA-
CHATTAHOOCHEE-FLINT
BASIN NO. 7

JANUARY 1, 1960

P-1-a



LEGEND

○ Municipal Source

(3) Industrial Sources (Number per county)

SOURCES OF POLLUTION

FIGURE P-1

SCALE

PUBLIC HEALTH SERVICE
REGION IV
APALACHICOLA-
CHATTAHOOCHEE-FLINT
BASIN NO. 7
JANUARY 1, 1960

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal and industrial sewage works which discharge to the Apalachicola-Chattahoochee-Flint Basin. Although located outside the Basin, Baldwin, Georgia and the Aldora section of Barnesville, Georgia discharge their wastes to the Apalachicola-Chattahoochee-Flint Basin, and are included in this memorandum. Griffin and Villa Rica, Georgia, Dothan, Headland, LaFayette, and Roanoke, Alabama, although located within the Basin, discharge only a portion of their wastes to the waters of the Basin and have been considered accordingly.

Existing and recommended municipal waste facilities have been listed as serving individual municipalities and other political entities. However, in the Atlanta metropolitan area which has been considered to consist of Clayton, Cobb, DeKalb, Fulton, and Gwinnett Counties, 1975 and 2000 needs were based on countywide projections and are listed in this manner. The existing facilities were, however, considered in the determination of future needs.

Data on specific industrial waste discharges in Fulton County are not available. However, local officials have indicated that the organic waste load contributed by these industries is minor as compared to the organic load contributed by the municipalities within the county.

Projected future pollution abatement requirements for industries and municipalities by the years 1975 and 2000 are presented, as are suggested solutions to present and anticipated future inadequacies. In connection with these solutions, an appraisal of the benefits to be derived from the proposed program and the annual costs of pollution abatement are included.

PROCEDURES AND INVESTIGATIONS

Existing data on pollution abatement in the Basin were obtained from reports, records, and correspondence of the Alabama State Department of Public Health, the Alabama Water Improvement Commission, the Florida State Board of Health, the Georgia Department of Public Health, the Georgia State Chamber of Commerce, the Georgia Department of Commerce, the U. S. Department of Agriculture and other Federal and State agencies. Where data were found to be lacking or outdated, extensive field investigations were conducted. Field investigations were conducted by the Georgia Department of Public Health, the Florida State Board of Health, and the Alabama Water Improvement Commission, and data were submitted to the Public Health Service for inclusion in this memorandum. These field investigations included visits to municipalities, small communities, industries, and institutions.

Data were obtained regarding 104 municipal (which includes 15 institutions) and 61 industrially owned sewage and waste works in the Basin (Figure P-1). Industries connected to municipal sewer systems were not inventoried. The data were carefully studied to establish both the present and future pollution abatement requirements.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for communities not listed in the census reports.

Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960, modified by consideration of changing economic conditions. However, the population projections of urban areas (municipalities of 2500 or more) were adjusted to match projections made by the U. S. Study Commission.

Existing industries are expected to increase or decrease their waste discharges in the future in proportion to the projected industrial growth or decline. In addition, a new pulp and paper industry is expected to locate in the Basin. For the purpose of this memorandum, it is assumed that municipalities of 800 or more should be sewered now and municipalities of less than 800 should be sewered whenever the present methods of disposal are considered inadequate. It is also assumed that each municipality, regardless of population, now partially sewered should extend its collection system to serve the total population.

In the administration of "Grants for Construction" under Section 6 of Public Law 660 and its amendments, the Public Health Service has established "The substantial removal of settleable solids" as the minimum acceptable treatment for projects in which the Federal Government participates. In general, the Public Health Service considers primary treatment to be the minimum acceptable degree of treatment for municipal sewage and an equivalent treatment the minimum for industrial liquid wastes. The need for additional treatment has been determined on the basis of expected dilution water available during periods of low stream flow and/or downstream water use. With the exception of the Florida portion of the Basin, stabilization ponds have been recommended for most municipalities with less than 1500 persons.

It is assumed that primary treatment plants will effect a 35 percent BOD removal and secondary plants will effect an 85 percent BOD removal. Tertiary treatment or a greater than 85 percent

BOD removal has not been considered for purposes of reducing low flow requirements. At these higher treatment efficiencies, dilution water requirements for water quality control depend on dilution of nutrients and chemicals present in the water rather than dilution of remaining BOD. Plant nutrients and chemicals are reduced very little, if any, in conventional sewage treatment plants and must, therefore, be considered as important pollutants in sewage effluents.

Sewage works costs have been estimated on the basis of per capita cost data developed by the Public Health Service and adjusted on the basis of the January 1, 1960 Engineering News Record Construction Cost Index for Atlanta, Georgia. Engineering, legal, and financing costs have been added on the basis of United States experience for the period July 1956-June 1959. Sewage system costs include the cost of structures, devices, equipment, and appurtenances intended for the collection and pumping of sewage. Treatment plant costs include the cost of treatment facilities and outfall lines.

Annual equivalent capital costs, annual operation and maintenance costs, and replacement costs of existing and needed pollution abatement facilities were estimated on the basis of January 1, 1960 constant dollars. An interest rate of 4$^{1}/_{4}$ percent was used for determining annual costs for both industries and municipalities.

GENERAL

Water pollution may be defined as the adding to water of any substance, or the changing of water's characteristics in any way which interferes with its use for legitimate purposes. Water polluting substances may be classified according to eight general categories: (1) sewage and other oxygen demanding wastes, (2) infectious agents, (3) plant nutrients, (4) organic chemical exotics, (5) sediments, (6) radioactive substances, (7) heat, and (8) toxic and other chemical substances.

The Nation and its communities, as well as business and private operations and individuals, incur losses or damages because of water pollution. Some of these losses or damages are reflected directly in additional costs for construction, operation and maintenance of water treatment facilities. By far the larger share of the total damages is not directly accountable. The impairment to health, the loss or dimunition of fishing and recreational uses, and depreciated property values, caused by polluted waters, have an adverse economic impact which is diffused throughout society. This is paid for through the reduction in utility of the water resources and the restriction on economic growth rather than through dollar payments for corrective devices. Unfortunately, these indirect consequences of pollution are not readily expressed in dollar terms because of their diffusiveness and because they are not recorded by direct, open-market transactions. Nevertheless, such adverse consequences are real and constitute a handicap to the fulfillment of economic and social goals.

Pollution control measures alleviate these adverse conditions and produce economic benefits associated with the improved waters. These benefits are often not apparent to the public, however, because they constitute insurance for future usefulness as well as for immediate purposes, or they may be indirect or intangible. The computation of these benefits faces the same difficulties as the computation of the total damages. That is, the dollar measurement problem has not yet been solved and a yardstick for actions or events not recorded in market transactions is lacking. Many of the benefits from pollution control are in this nonmarket realm, e.g., enhancement of fishing and recreational opportunity, protection of health, scenic improvement, and assurance of the future utility of water resources for various other purposes. The private market price system, therefore, cannot be relied upon solely or chiefly to provide the measurement. New devices for taking into account the social or public values must be devised.

INVENTORY OF POLLUTION ABATEMENT

SOURCES OF POLLUTION

The surface waters of the Basin are used for the final disposal of liquid wastes, treated and untreated, from 104 municipalities (including 15 institutions), and 61 industries as shown by Tables P-1 and P-2. Municipalities and institutions discharge 127.5 mgd of sewage of which 100.1 mgd has undergone treatment of some type and industries discharge 18.4 mgd of which 3.1 mgd has undergone treatment of some type.

A total of 973,830 persons are served by the 104 municipalities and institutions which discharge to the Apalachicola-Chattahoochee-Flint Basin. The total population equivalent (PE) of the municipal sewage in the Apalachicola-Chattahoochee-Flint Basin is estimated to be 1,474,100 before treatment and 934,300 of this total is discharged to the Basin's waters after treatment.

The industrial wastes produced in the Basin include textile, metal, food, chemical, and pulp and paper wastes. The textile industry which is the most numerous industry in the Basin, accounts for 27 of the 61 industries inventoried. The strength of the organic wastes from the 42 industries for which data were available is estimated to be 345,800 PE based on BOD. The PE of ten industries inventoried was undetermined. There are nine other industries which produce inorganic liquid wastes such as acids, alkalies, sediments, etc. The total population equivalent of the industrial wastes after treatment is estimated to be 338,700.

TABLE P-1
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity PE 1,000s	Design Capacity Flow mgd	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Receiving Stream
ALABAMA									
Abbeville	2,524	2,500	0.250	none	--	--	2,500	2,500	Trib-Abbie Cr-Chattahoochee R
Ashford	1,511	800	0.080	secondary	1.5	0.150	800	80	Br-Cowarts Cr-Apalachicola R
Columbia	783	600	0.006	none	--	--	600	600	Chattahoochee R
Dothan (part)	31,440	7,500	0.518	secondary	10.0	1.000	7,500	760	Br-Omussee Cr-Chattahoochee R
Eufaula	8,357	4,500	0.350	none	--	--	4,500	4,500	Chattahoochee R
Fairfax (unincorp)	3,107	3,100	0.300	primary	1.0	0.100	3,100	2,500	Osanippa Cr-Chattahoochee R
Headland (part)	2,650	1,100	0.100	none	--	--	1,100	1,100	Mill Cr-Omussee Cr-Chattahoochee R
Hurtsboro	1,056	800	0.080	none	--	--	800	800	Br-N.F. Cowikee Cr-Chattahoochee R
LaFayette (part)	2,605	1,500	0.150	none	--	--	1,500	1,500	Allen Cr-Kellum Hill Cr-Chattahoochee R
Langdale-Shawmut	4,426	4,425	1.085	none	--	--	5,230	5,230	Chattahoochee R
Lanett	7,674	5,300	0.500	none	--	--	6,150	6,150	Chattahoochee R
Phenix City	27,630	15,000	1.500	none	--	--	19,000	19,000	Chattahoochee R
Riverview (unincorp)	1,171	1,170	0.120	none	--	--	1,420	1,420	Chattahoochee R
Roanoke (part)	5,288	300	0.030	none	--	--	300	300	Guss Cr-Chattahoochee R
FLORIDA									
Apalachicola	3,099	2,100	0.200	secondary	4.0	0.400	2,100	400	Sciplo Cr-Apalachicola R
Blountstown	2,375	1,400	0.112	septic tk	0.5	0.040	1,400	1,400	Creek-Apalachicola R
Chattahoochee	9,699	2,713	0.200	primary	4.0	0.320	2,713	1,100	Mosquito Cr-Apalachicola R
State Hospital	7,300	7,300	1.800	secondary	5.0	2.000	13,000	6,000	Mosquito Cr-Apalachicola R
Cottondale	849	550	0.055	septic tk	undet	undet	550	500	Ditch-Creek-Chipola R
Marianna	7,152	7,700	0.800	primary	10.0	1.000	7,700	5,000	Marshall Cr-Chipola R
Florida School for Boys	950	950	0.095	secondary	0.8	0.068	950	150	Marshall Cr-Chipola R
Sneads Housing Project	108	108	0.009	septic tk, filter	0.1	0.010	108	20	Ditch-Hamm Pond-Apalachicola R

(1/23/62)

TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity PE 1,000s	Design Capacity Flow mgd	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Receiving Stream
FLORIDA - cont'd									
St. Hospt. Farms	235	235	0.030	secondary	0.3	0.015	235	30	Ditch-L Seminole
Apalachee Corr. Int.	600	600	0.181	primary	0.6	0.060	600	390	L Seminole
GEORGIA									
Albany	55,890	35,750	10.000	primary	125.0	10.000	89,000	57,850	Flint R
Radium Springs S/D	375	300	0.030	none	--	--	300	300	Flint R
Marine Supply Ctr	2,593	2,593	0.409	secondary	undet	2.250	2,590	500	Flint R
Americus Pt #1	13,472	5,650	0.900	secondary	14.0	1.400	5,700	2,000	Muckalee Cr-Flint R
Pt #2		800	0.080	secondary	2.0	0.200	800	200	Willets Cr-Muckalee Cr-Flint R
S. Ga. Voc. Sch.	450	450	0.040	secondary	0.7	0.070	450	300	Sweetwater Cr-Flint R
Arlington	1,462	500	0.050	septic tk	undet	undet	500	450	Spring Cr-Lake Seminole
Arnco Village	1,000	800	0.080	primary	0.7	0.070	800	600	Wahoo Cr-Chattahoochee R
Atlanta (part)[1]									
Camp Creek Pt.		12,000	1.000	primary	25.0	2.500	12,000	6,000	Chattahoochee R
Clayton Pt		352,000	50.400	primary	420.0	42.000	640,000	391,000	Chattahoochee R
Flint River Pt.		18,920	1.600	secondary	20.0	2.000	21,800	3,050	Flint R
Sandy Creek Pt.		4,390	0.540	primary	10.0	1.000	4,400	1,470	Chattahoochee R
Utoy Creek Pt.		34,300	4.400	primary	90.0	9.000	40,145	23,000	Chattahoochee R
Austell	1,867	1,250	0.150	primary	5.0	0.500	1,250	875	Sweetwater Cr-Chattahoochee R
Bainbridge	10,210	5,000	0.500	none	--	--	5,000	5,000	Flint R-Lake Seminole
Barnesville (part)	--	700	0.070	secondary	1.30	0.130	700	110	L. Potato Cr-Flint R
Blakely	3,580	4,000	0.400	secondary	10.0	1.000	4,000	600	Dry Cr-Spring Cr-L Seminole
Buena Vista	1,574	1,000	0.080	primary	2.5	0.250	1,425	850	Branch-Oochee Cr-Flint R
Buford	4,151	3,800	0.200	primary	5.0	0.500	3,800	2,700	Suwannee Cr-Chattahoochee R
Buford Dam	30	140	0.007	septic tk	undet	undet	100	25	Chattahoochee R
Butler	1,346	1,100	0.050	primary	undet	undet	1,100	725	Br Patsiliga Cr-Flint R
Byromville	349	100	0.007	none	--	--	100	100	Turkey Cr-Flint R
Camilla	4,753	3,500	0.200	secondary	5.0	0.500	3,500	500	Br-Big Slough Cr-Flint R
Clarkdale	440	440	0.075	primary	1.3	0.050	565	375	Sweetwater Cr-Chattahoochee R

(1/23/62)

TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
GEORGIA - cont'd									
Clarkesville	1,352	1,300	0.150	primary	2.0	0.200	2,000	1,300	Soque R-Chattahoochee R
Clayton County (part)	--	2,400	0.240	secondary	10.0	1.000	2,400	2,150	Flint R
College Pks Ests	475	475	0.047	secondary	0.8	--	475	50	Branch-Flint R
Cleveland	657	400	0.040	primary	0.7	0.056	400	250	Br-Tesnatee Cr-Chestatee R
Cobb County (part)[2]	--	15,150	1.050	secondary	5.0	0.500	15,150	6,000	Nickajack Cr-Chattahoochee R
College Park	23,469	5,500	0.500	secondary	12.0	1.200	5,500	600	Walters Creek-Flint R
Colquitt	1,556	1,500	0.150	primary	1.2	0.128	1,500	1,000	Spring Cr-Flint R
Columbus	116,776	140,000	19.500	none	--	--	195,000	195,000	Chattahoochee R
Cordele	10,609	7,000	1.500	secondary	14.0	1.400	7,000	4,000	Gum Cr-Flint R
Cornelia	2,936	2,400	0.500	secondary	2.5	0.250	2,500	1,000	N.F.-L Mud Cr-Chattahoochee R
Cumming	1,561	300	0.600	primary	0.5	0.050	12,300	12,300	Trib-Big Cr-Chattahoochee R
Cuthbert	4,300	2,580	0.258	none	--	--	2,580	2,580	Town Br-Carterer-Ichawaynochaway Cr
Dahlonega	2,604	1,500	0.150	primary	3.2	0.320	1,500	1,000	Trib-Cane Cr-Chestatee R-Chattahoochee R
Dawson	5,062	2,920	0.292	none	--	--	2,920	2,920	Brantley Cr-Chickasawhatchee Cr-Flint R
Decatur Prison Br	85	85	0.006	none	--	--	85	85	Ditch-Flint R-Lake Seminole
Demorest	1,029	1,000	0.050	primary	1.3	0.130	1,000	700	Hazel Cr-Soque R-Chattahoochee
Dobbins AFB - Air Force Pt #6	12,000	12,000	2.000	primary	50.0	5.000	12,000	6,000	Nickajack Cr-Chattahoochee R
Donalsonville	2,621	1,800	0.125	primary	3.0	0.300	1,800	1,200	Fish Pond Dr-Spring Cr-Lake Seminole
Douglasville	4,423	2,950	0.250	primary	2.4	0.240	3,000	2,400	Gothards Cr-Sweetwater Cr-Chattahoochee R
East Newnan (uninc)	1,874	650	0.065	none	--	--	650	650	Trib-White Oak Cr-Flint R
East Thomaston	2,237	2,240	0.500	none	--	--	2,500	2,500	Br-Swift Cr-Flint R
Edison	1,232	800	0.080	primary	2.0	0.200	800	500	Town Br-Ichawaynochaway Cr-Flint R
Fairburn #1	2,470	930	0.060	secondary	0.6	0.060	930	500	Deep Creek-Chattahoochee R
#2		930	0.060	secondary	0.4	0.040	930	500	Spence Br-Flint R
Fayetteville (1/23/62)	1,389	300	0.015	none	--	--	300	300	branch-Flint R

TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
GEORGIA - cont'd									
Fort Benning #1	80,000	55,580	2.440	none	--	--	55,580	55,580	Chattahoochee R
#2	--	16,800	0.740	secondary	undet	5.600	16,800	4,420	Upatoia Cr-Chattahoochee
Fort Gaines	1,314	1,000	0.100	none	--	--	1,000	1,000	Chattahoochee R
Gainesville Pt #1	16,523	5,000	2.530	secondary	30.0	3.000	14,000	2,000	Lake Lanier
Pt #2		4,000	1.600	secondary	15.0	1.500	54,000	12,000	Flat Cr-Lake Lanier
Grantville #1	1,158	750	0.075	septic tk	undet	undet	750	650	Trib-New R-Chattahoochee R
#2		450	0.045	septic tk	undet	undet	450	400	Trib-Yellow Jacket Cr-Chattahoochee R
Greenville	726	600	0.060	none	--	--	600	600	Trib-Red Oak Cr-Flint R
Griffin (part)	10,868	8,000	0.800	secondary	13.0	1.350	8,000	1,200	Ison Br-Flint R
Hampton	1,235	1,500	0.100	secondary	2.0	0.200	1,500	400	Bear Cr-Flint R
Hogansville	3,658	3,500	0.300	septic tk	undet	undet	3,500	3,450	Yellow Jacket Cr-Chattahoochee R
Jonesboro	3,014	1,200	0.060	primary	undet	undet	1,200	950	Br-½ Mile Cr-Flint R
LaGrange Pt #1	23,632	1,000	0.070	secondary	2.5	0.250	1,000	100	Br-Yellow Jacket Cr-Chattahoochee R
Pt #2		15,000	2.500	secondary	35.0	3.500	20,000	5,350	Blue John Cr-Chattahoochee R
Pt #3		7,500	0.750	none	--	--	7,500	7,500	Yellow Jacket Cr-Chattahoochee R
Leesburg	774	300	0.030	septic tk	undet	undet	300	300	Trib-Kinchafoonee Cr-Flint R
Lee Prison Br.	158	158	0.016	septic tk, ponds	undet	undet	160	50	Trib-Kinchafoonee Cr-Flint R
Lumpkin	1,348	830	0.083	primary	0.8	0.050	830	540	Hodchodkee Cr-Patula Cr-Chattahoochee R
Manchester	4,115	4,110	0.500	secondary	5.0	0.500	5,000	750	Pigeon Cr-Flint R
Marietta	25,565	31,600							
Eastside Pt			0.878	secondary	25.0	2.500	23,000	4,700	Soap Cr-Chattahoochee R
Southeast Pt			0.305	secondary	20.0	2.000	4,400	450	Rotten Wood Cr-Chattahoochee
Southside Pt			0.238	secondary	10.0	1.000	3,350	675	Olley Cr-Sweetwater Cr-Chattahoochee R
Westside Pt			0.261	secondary	10.0	1.000	3,650	400	Br-Noses Cr-Chattahoochee R

(1/23/62)

TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
GEORGIA - cont'd									
Meriwether Co.									
Prison Branch	85	85	0.009	septic tk	undet	undet	85	85	Trib-Mill Cr-Flint R
Montezuma	3,744	1,900	0.190	none	--	--	1,900	1,900	Beaver Cr-Flint R
New Holland (uninc)	1,570	1,570	0.190	secondary	4.0	0.280	1,900	200	Limestone Cr-Lake Lanier
Newnan Pt #1	12,169	3,000	0.300	none	--	--	3,000	3,000	Trib-Wahoo Cr-Chattahoochee
Pt #2		4,000	0.300	secondary	4.5	0.340	4,000	800	Mineral Sprs Cr-Mountain Cr-Chattahoochee R
Pt #3		3,000	0.330	secondary	3.2	0.350	3,000	600	Cotton Mill Cr-White Oak Cr-Flint R
Norcross									
Winter Hill S/D	350	350	0.035	secondary	0.3	0.030	350	100	Trib-Crooked Cr-Chattahoochee
Camp Ground	40	40	0.003	septic tk, filter	undet	undet	40	20	Trib-Peachtree Cr-Chattahoochee R
Oglethorpe	1,169	350	0.015	none	--	--	350	350	Mill Cr-Flint R
Palmetto	1,446	950	0.030	primary	1.5	0.170	950	625	Bear Cr-Chattahoochee R
Pine Mountain	790	450	0.020	primary	0.7	0.050	450	300	Turkey Cr-Flat Shoals Cr-Chattahoochee R
Potterville (uninc)	150	150	0.008	none	--	--	150	150	Horse Cr-Chattahoochee R
Reynolds	1,087	650	0.026	none	--	--	650	650	Patsiliga Cr-Flint R
Richland	1,472	1,100	0.110	septic tk	undet	undet	1,100	900	Bear Cr-Chattahoochee R
Roswell Housing Auth.	--	200	0.020	secondary	3.3	0.330	200	25	Big Cr-Chattahoochee R
Sargent (uninc)	1,500	800	0.060	primary	1.2	0.060	800	500	Wahoo Cr-Chattahoochee R
Shellman	1,050	600	0.060	none	--	--	600	600	Ichawaynochaway Cr-Flint R
Smithville	723	200	0.020	none	--	--	200	200	Muckaloochee Cr-Flint R
Smyrna (part)	10,157	5,000	0.325	secondary	4.0	0.400	5,000	1,000	Bohannon Cr-Nickajack Cr
Thomaston	9,336	10,500	2.000	secondary	10.0	1.000	12,500	7,000	Town Br-Potato Cr-Flint R
Turner AFB	5,000	5,000	0.253	secondary	6.0	0.600	5,000	750	Flint R
Vienna	2,097	1,000	0.100	none	--	--	1,000	1,000	Pennahachee Cr-Flint R
Villa Rica (part)	3,450	1,000	0.100	secondary	0.6	0.060	1,000	600	Sweetwater Cr-Chattahoochee R

(1/23/62)

TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
APALACHICOLA-CHATTAHOOCHEE-FLINT BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
GEORGIA - cont'd									
Warm Springs Found.	350	325	0.046	secondary	0.8	0.180	300	100	Trib-Cane Cr-Flint R
West Point	4,610	3,900	0.450	none	--	--	3,900	3,900	Chattahoochee R
Totals		973,842	127.542				1,474,096	934,315	

---

[1] Serves Doraville, Chamblee, North Atlanta, and portions of Clarkston, Decatur, East Point, Hapeville, and College Park.
[2] Serves a portion of Smyrna.

(1/23/62)

TABLE P-2

BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION

(Excludes industries connected to municipal sewer systems)

APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
ALABAMA									
Chambers	A	1,902	textile	bleach & dye	1.200	none	25,000	25,000	ditch-Osanippa Cr-Chat R
	B	703	textile	bleach & dye	4.000	none	50,000	50,000	Chattahoochee R
	E	140	textile	latex	0.070	septic tank	250	190	Osanippa Cr-Chat R
	H	130	textile	process	0.026	septic tank	250	250	Osanippa Cr-Chat R
FLORIDA									
Jackson	A	14	food	rendering	0.003	none	undet	undet	Chipola R
	B	50	chemical	fertilizer	0.865	none	--	--	swamp
GEORGIA									
Clayton	Y	1,800	metal	plating	0.168	chem prec	--	--	Flint R
Cobb	B	125	paper	box board	0.285	lagoons	2,280	450	Sweetwater Cr-Chat R
	C	50	rubber	latex & clay	0.004	chem prec	undet	undet	Sweetwater Cr-Chat R
Coweta	D	90	food	meat pk	0.500	none	4,000	4,000	ditch-White Oak Cr-Flint R
	E	350	textile	dye	0.213	none	3,500	3,500	Messiers Cr
	F	700	metal	acids & alk	0.070	none	--	--	trib-Mountain Cr-Chat R
	G	600	textile	bleacn & dye	0.040	none	5,000	5,000	trib-Wahoo Cr-Chat R
	H	625	textile	dye	0.120	none	5,000	5,000	br-Wahoo Cr-Chat R
	I	150	textile	dye	0.200	none	4,000	4,000	br-Wahoo Cr-Chat R
Crisp	J	20	chemical	fertilizer	0.024	none	--	--	ditch-Gum Cr-Flint R
DeKalb	QQQ	2,500E	metal	oils, paints	undet	none	--	--	Nancy Cr-Chattahoochee R
Dougherty	L	6	food	rendering	0.002	none	undet	undet	Flint R
	Q	10	food	dairy	0.035	none	30	0	ditch-lime sink
	T	55	paper	inks & glue	0.001	broad irr	undet	undet	ground
Fulton[1]	U	70	chemical	pharmaceuticals	1.350	none	undet	undet	Flint R
Gwinnett	V	42	food	rendering	0.075	stab pond	3,300	1,000	Ivy Cr-Suwannee Cr-Chat R

(1/23/62)

TABLE P-2 (CONT'D)
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
GEORGIA - Cont'd									
Gwinnett	W	225	tannery	tanning	0.430	vib screens	29,200	29,200	Suwannee Cr-Chat R
Habersham	Z	225	textile	sanitary	0.005	none	55	55	Soque R-Chat R
	AA	386	textile	sanitary	0.004	none	100	100	branch-Mud Cr-Chat R
	UU	undet	food	poultry proc	undet	none	10,000	10,000	branch-Mud Cr-Chat R
Hall	BB	750	textile	starch & kier	0.240	secondary	2,670	270	Balus Cr-Lake Lanier
	CC	1,300	textile	san & proc	0.100	secondary	470	55	Limestone Cr-Lake Lanier
Harris	DD	20	pump sta	cooling water	0.025	none	--	--	trib-Upatoie Cr-Chat R
	EE	100	food	poultry proc	0.102	screens	4,250	4,250	Palmetto Cr-Mulberry Cr
Lamar	FF	4	food	meat pk	0.005	none	240	240	branch-Big Potato Cr
Macon	GG	400	food	canning	0.400	vib screens	20,000	20,000	Beaver Cr-Flint R
	HH	225	textile	bleach & dye	0.015	none	undet	undet	ditch-Flint R
	II	125	textile	bleach & dye	0.015	none	undet	undet	Flint R
Marion	JJ	90	food	poultry proc	0.125	screens	3,825	3,825	Oochee Cr-Chat R
Meriwether	KK	75	food	canning	0.240	screens	12,000	12,000	trib-Cane Cr-Flint R
	LL	1,000	textile	weaving	0.070	none	3,600	3,600	Pigeon Cr-Flint R
Mitchell	MM	6	food	meat pk	0.012	catch bas	385	385	Big Slough Cr-Flint R
	NN	65	chemical	wood pres	0.002	inj well	undet	undet	ditch to dry well
	OO	100	food	poultry proc	0.140	screens	4,800	4,800	Br-Big Slough Cr-Flint R
	PP	50	chemical	acid & phos	0.124	none	--	--	Br-Big Slough Cr-Flint R
Muscogee	QQ	1,466	textile	bleach & dye	1.310	none	19,000	19,000	Chattahoochee R
	RR	1,066	textile	dye	1.000	none	21,000	21,000	Chattahoochee R
	SS	66	chemical	chemical	0.072	none	--	--	ditch-Bull Cr-Chat R
	TT	1,050	textile	starch	0.017	none	300	300	Chattahoochee R
	YY	1,913	textile	sanitary	0.005	none	1,480	1,480	stream-Chattahoochee R
Pike	ZZ	15	food	canning	0.020	settling	5,000	5,000	Elkins Cr-Flint R
	AAA	200	food	canning	0.050	screens	2,200	2,200	Elkins Cr-Flint R
Spalding	BBB	275	textile	sanitary	0.001	none	70	70	branch-Flint R
	PPP	100	food	canning	0.320	screens	1,600	1,600	Potato Cr-Flint R

(1/23/62)

TABLE P-2 (CONT'D)
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
GEORGIA - Cont'd									
Sumter	CCC	40	chemical	fertilizer	0.060	none	--	--	ditch-Muckalee Cr-Flint R
	DDD	7	food	meat pk	0.018	screen	1,100	1,100	ditch-Town Cr-Flint R
	EEE	41	food	canning	0.315	screen	10,000	10,000	Sweetwater Cr-Flint R
	FFF	35	chemical	wood pres	0.001	none	undet	undet	trib-Muckalee Cr-Flint R
Talbot	GGG	7	textile	dye	0.030	none	4,800	4,800	swamp
Troup	HHH	600	textile	bleach & dye	0.403	none	7,000	7,000	Lone Cane Cr-Chat R
	III	1,050	textile	process	0.093	none	8,000	8,000	Shoal Cr-Chat R
	JJJ	1,000	textile	process	0.150	none	36,000	36,000	Yellow Jacket Cr-Chat R
	KKK	1,500	textile	dye	0.763	none	10,000	10,000	Blue John Cr-Lone Cane Cr
Upson	LLL	2,150	textile	bleach & dye	2.500	none	20,000	20,000	br-Swift Cr-Flint R
	MMM	1,860	textile	process	0.010	none	undet	undet	Potato Cr-Flint R
Totals					18.443		341,755	334,720	

---

[1] Data not available (see text).

(1/23/62)

The waters of the Basin also receive pollution from natural sources and from the agricultural use of the land. Pollution from natural sources include organic material leached from the decaying matter in the forests and swamps and minerals dissolved from the soil and rocks. The pollution resulting from the agricultural use of the land includes organic and mineral fertilizers, insecticides, pesticides, and herbicides which are washed into the waters during heavy rains or which are inadvertently deposited into the waters during application. Silt eroded from roadsides and from land, especially in the Piedmont Province, is a pollutant in the upper portion of the Basin. Drainage from livestock feed lots, dairy barns, pig pens, manure heaps, and other farm refuse also adds to the pollution load carried by the streams.

EXISTING SEWAGE TREATMENT FACILITIES

As shown by Table P-1, 34 municipalities and institutions provide secondary treatment for sewage collected from 208,240 persons (or 22 percent of the total sewered population discharging sewage to the Basin's waters). Stabilization ponds have been considered as secondary treatment plants for the purpose of this summary.

There are 27 municipalities and institutions in the Basin which provide primary treatment for the sewage collected from 488,720 persons (or 50 percent of the total sewered population discharging sewage to the Basin's waters).

Septic tanks are provided by 12 municipalities and institutions serving 9,080 persons (or about one percent of the total sewered population discharging sewage to the Basin's waters). The septic tanks at Blountstown and Cottondale in Florida, and Arlington, Grantville, Hogansville, Leesburg, Meriwether County Prison and Richland in Georgia, are overloaded and consequently ineffective as treatment facilities.

The remaining 31 municipalities and institutions which discharge sewage to the Basin's waters provide no treatment. Approximately 201,400 persons are served by the collection systems in these municipalities. In addition, Fort Benning, LaGrange, and Newnan, Georgia, provide treatment for only a portion of their sewered population. The remaining sewered portion (66,000) is discharged untreated. Sewage collected from a total of 267,400 persons (or 27 percent of the total sewered population discharging sewage to the Basin's waters) is discharged untreated to surface waters.

The sewage treatment plants listed for the City of Atlanta, Georgia also serve Doraville, Chamblee, North Atlanta, and portions of Clarkston, Decatur, East Point, Hapeville, and College Park.

The Cobb County plant also serves a portion of the City of Smyrna, Georgia.

As shown by Table P-2, 22 of the 61 industries listed provide treatment of some degree to their liquid wastes. Thirteen of these, however, provide no reduction of the BOD load discharged from the plants. The remaining 39 industries provide no treatment for their liquid wastes. Thus, a total of 57 industries are listed as providing no reduction of the BOD load discharged to the Basin's waters.

Four industries provide the equivalent of secondary treatment and two provide chemical precipitation treatment for their industrial liquid wastes. One industry uses its waste for broad irrigation and one disposes it by subsurface injection. The remaining 53 industries provide either septic tanks, screens, catch basins or no treatment at all for their wastes.

As stated previously, data regarding specific industrial waste discharges in Fulton County are not available; and, therefore, have not been included in Table P-2. All other industries in the Basin, however, discharge liquid wastes either to septic tanks with subsurface drain fields or to municipal sewer systems. Industries disposing of liquid wastes by these methods were not inventoried and no data are available.

Soil conservation practices used in many areas of the Basin are very useful in preventing pollution resulting from agricultural use of the land. Good erosion preventative measures, practiced by the highway and railroad maintenance departments assist in the control of sediment coming from roadway embankments. There are no pollution control measures used especially for the purpose of abating pollution from natural sources.

EFFECTS ON STREAMS

There have been several field studies of the Chattahoochee River portion of the Apalachicola-Chattahoochee-Flint Basin conducted by the Public Health Service. Reaches of the river studied have included the main stem between Gainesville and Atlanta, between Atlanta and LaGrange, Columbus-Phenix City and Eufaula, and between Eufaula and the Georgia-Florida State line. In addition, field studies were conducted in several tributaries of the Chattahoochee River above Buford Dam. The Florida State Board of Health has studied the Apalachicola River portion of the Basin and the Alabama Water Improvement Commission has studied the reach of the Chattahoochee River below Lanett, Alabama. The Public Health Service has also conducted several studies in the Flint River arm of the Jim Woodruff (Lake Seminole) Reservoir.

The field studies conducted in 1949-50 by the Public Health Service in the upper portion of the Chattahoochee River showed that the waters below Atlanta were appreciably degraded in quality due to the discharge of partially treated wastes from the Atlanta area. Depressed dissolved oxygen levels, high coliform organism counts and high values of biochemical oxygen demand (BOD) were measured some 10 to 15 miles downstream from Atlanta's Clayton sewage treatment plant. High coliform organism concentrations were measured in the vicinity of the Gainesville waste outfalls indicating water quality degradation in this section of the river. As these studies were conducted in 1949 and 1950, subsequent developments such as closure of Buford Dam, installation of waste treatment facilities, and the rapid municipal and industrial growth of the Atlanta metropolitan area has changed the quality conditions of this reach of the Chattahoochee River. Further investigation will be needed to determine the extent of these changes.

More recent studies by the Public Health Service were conducted on the waters of the lower Chattahoochee River below the Columbus-Phenix City metropolitan area. These studies, carried out in 1959, indicated that the major use of the Chattahoochee River from the Columbus-Phenix City area to the headwaters of the Jim Woodruff (Lake Seminole) Reservoir is for the disposal of untreated municipal and industrial wastes. The major sources of these wastes are Columbus, and the Fort Benning Military Reservation in Georgia, and Phenix City, and Eufaula in Alabama. The water quality in the lower reach of the Chattahoochee was found degraded to the point of being unsuitable as a source of public water supply and unsafe for recreational uses such as boating, swimming, water skiing and fishing. Completion of the Walter F. George and Columbia Lock and Dams in the lower Chattahoochee River will affect the quality of these waters. Further investigation will be needed to determine the extent of these effects.

Field studies made by the Florida State Board of Health in 1947-48 indicated the Apalachicola River was grossly polluted insofar as bacteria content was concerned throughout its length. The discharge of untreated municipal wastes to the Flint and Chattahoochee Rivers by various cities in Alabama and Georgia was concluded to be the major source of this pollution. Additional field studies conducted in 1957 after completion of the Jim Woodruff Dam showed that the bacterial pollution of the Apalachicola River had been greatly reduced. Although the major pollution sources had continued unabated, the installation of a reservoir with a long detention time had markedly reduced the concentration of bacteria in the river below the dam.

Field studies of the Flint River portion of the Apalachicola-Chattahoochee-Flint Basin have been limited to the lowermost reach in the Jim Woodruff Reservoir. Recent studies, made in 1958 and 1960, have indicated that a local pollution problem exists in the vicinity of Bainbridge, Georgia due to the discharge of untreated wastes by that municipality.

Localized pollution problems have been observed to exist in several other areas within the Basin. These problems are due generally to the discharge of untreated or partially treated municipal and industrial wastes.

During November 1960, January and February 1961, and June 1961, the Public Health Service conducted field studies which covered three stations on the Flint River, at Griffin, Montezuma and Albany, Georgia; and two stations on the Chattahoochee River, at Franklin and West Point, Georgia.

The average dissolved oxygen measured at the three stations on the Flint River ranged from 74.5 to 99.2 percent of saturation. The median coliform concentration at the Albany station ranged from 9300 to 166,500 Most Probable Number (MPN) per 100 ml and at the other two stations the range was from 930 to 4300 MPN per 100 ml. These results indicated a local pollution problem existing in the Flint River at Albany, Georgia.

The average dissolved oxygen of the Chattahoochee River at Franklin, Georgia ranged from 73.8 to 77.1 percent of saturation and from 78.6 to 93.2 percent at the downstream West Point station. Median coliform concentrations at the Franklin station ranged from 43,000 to 93,000 MPN per 100 ml in comparison to a range of 6800 to 22,500 MPN per 100 ml at the downstream West Point station. These results indicated that although the quality of the Chattahoochee River improved between Franklin and West Point, the water quality at both these stations was degraded by the discharge of municipal and industrial wastes from upstream sources. These data are taken from the report, Water Quality Basic Data - Southeast River Basins, 1961 prepared for the U. S. Study Commission by the Public Health Service.

The studies and reports referred to above have indicated areas where pollution problems have existed. The conditions reported will no doubt change due to the rapidly changing economy of the Basin area and due to the completion of the several water resources projects now being constructed. More detailed and extensive field studies will be needed to adequately determine the effects of these developments upon the quality of the surface waters in the Apalachicola-Chattahoochee-Flint Basin.

POLLUTION ABATEMENT REQUIREMENTS FOR 1960

SEWERAGE

At the present time, 63 municipalities in the Basin serve only part of their populations and 13 municipalities with populations of 800 or more have no sewage collection system. The 63 municipalities with existing systems should extend their collection systems to serve an additional 130,940 persons and the 13 municipalities should construct new collection systems to serve 13,500 persons. The total capital outlay required as shown in Table P-3 is estimated to be $7,222,000.

TREATMENT FACILITIES

The degree of treatment required at each municipality has been determined on the basis of dilution water available during periods of low stream flow and/or downstream water use. Dilution water use requirements are discussed more fully in the LOW FLOW AUGMENTATION section of this memorandum.

Existing treatment facilities at 20 municipalities and institutions are adequate for present needs. These are the Florida State Hospital at Chattahoochee, Marianna, the Florida School for Boys, at Marianna, the Florida State Hospital Farm at Sneads, the Marine Supply Center at Albany, the South Georgia Vocational School at Americus, Barnesville, Blakely, Clarkdale, College Park Estates, Demorest, Dobbins Air Force Base, Hampton, Jonesboro, Lee Prison Branch, Manchester, Marietta, New Holland, the Winter Hill subdivision at Norcross, and Turner Air Force Base at Albany.

There are 36 municipalities which presently do not provide treatment or have only septic tanks and should construct new treatment plants. Of this total, 9 should construct secondary treatment plants, 13 should construct stabilization ponds, and 12 should construct primary treatment plants. Roanoke, Alabama, although listed in Table P-1, will discharge its waste outside the Apalachicola-Chattahoochee-Flint Basin in the future; and it has been assumed that Newnan and East Newnan will be served by one sewage system in the future.

There are 24 municipalities which should either make addition or enlargements to their existing treatment plants. Ten should add secondary units, one should add stabilization ponds to existing primary treatment plants and the remainder should increase the capacity of their existing systems. The total capital outlay required for needed new construction and additions to existing sewage treatment plants is estimated to be $28,778,000, as shown by Table P-3.

Industrial liquid waste disposal by 8 of the industries surveyed is adequate at present. However, the remaining 53 industries should provide more satisfactory methods of waste treatment and disposal. Fourteen of these industries could connect to nearby municipal sewer systems. Primary treatment should be provided by seven of the industries and five should provide secondary treatment. Stabilization ponds should be provided by 19 of the industries and one industry should provide septic tanks. The remaining seven industries should provide either chemical precipitation, neutralization or other similar types of treatment. The total capital outlay required for industrial pollution abatement facilities in 1960 is estimated to be $6,217,000 as shown by Table P-4.

OTHER NEEDS

As mentioned in the EFFECTS ON STREAMS section, there have been several field surveys conducted to determine the quality of several reaches of the Chattahoochee River portion of the Basin. The results of these surveys have indicated that the water quality of the Chattahoochee River in these reaches had been degraded by municipal and industrial wastes.

Since these surveys were conducted, there have been a number of river development projects either constructed or which are presently under construction or are being actively planned. In addition, there have been a number of other uses which have been made of the waters of the river. These changes in river development and use have had and will continue to have a considerable effect upon the quality of the waters which in turn may affect future water uses.

The planned navigation, power and flood control developments in the Flint River portion of the Basin will result in changes in water quality which may affect future uses of these waters. Little information is presently available concerning the quality of the Flint River.

The Atlanta metropolitan area will, in the future, become more dependent upon the surface waters of the Basin; especially the Chattahoochee River. Water requirements for both municipal and industrial water supply and water quality control for the Atlanta metropolitan area will increase rapidly in the future.

The importance of the Atlanta metropolitan area to the development of the entire SERB area is illustrated by the fact that approximately 40 percent of the present and projected future urban population of the SERB area is expected to be in the Atlanta area.

For the reasons indicated above, it is imperative that a

TABLE P-3
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Treatment Facilities		Estimated Costs in $1,000		
Municipality	Des'd for (1,000 PE)	Type Recommended	Sewerage	Treatment	Total
ALABAMA					
Abbeville	2.8	secondary	1	48	49
Ashford	1.5	secondary	36	--	36
Columbia	0.8	secondary	14	20	34
Cottonwood	1.5	secondary	48	31	79
Dothan (part)	10.0	secondary	149	--	149
Eufaula	8.4	secondary	193	760	953
Fairfax	3.6	primary	--	193	193
Headland (part)	1.8	secondary	14	35	49
Hurtsboro	1.4	secondary	13	30	43
LaFayette (part)	1.6	secondary	--	32	32
Langdale-Shawmut	5.9	primary	--	350	350
Lanett	10.7	primary	228[1/]	497	725
Phenix City	31.6	primary	632	1449	2081
Riverview	1.5	primary	--	134	134
FLORIDA					
Apalachicola	4.0	primary	50	--	50
Blountstown	2.5	primary	49	192	241
Chattahoochee	4.0	primary	45	--	45
Cottondale	1.0	secondary	15	165	180
Sneads	1.4	primary	70		
Apalachee Corr. Institute	0.6	secondary	--	41	41
Wewahitchka	1.9	primary	72	158	230
GEORGIA					
Albany	125.0	primary	1007	--	1007
Alpharetta	1.4	secondary	68	207	275
Americus	16.0	secondary	351	--	351
Arlington	1.8	primary	48	152	200
Arnco Village	1.0	secondary	10	23	33
Atlanta (Clayton plant)	650.0	primary	500[2/]	5500	6000
Austell	5.0	primary	31	--	31

(6/1/62)

TABLE P-3 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Treatment Facilities		Estimated Costs in $1,000		
Municipality	Des'd for (1,000 PE)	Type Recommended	Sewerage	Treatment	Total
GEORGIA - Cont'd					
Bainbridge	10.2	secondary	260	889	1149
Buena Vista	2.5	secondary	29	124	153
Buford	5.0	secondary	19	222	241
Butler	1.3	secondary	12	75	87
Byromville	0.4	secondary	12	14	26
Camilla	5.0	secondary	63	--	63
Clarksville	2.0	primary	3	--	3
Clayton Co. Sewer System	16.0	secondary	596[3/]	603	1199
Cleveland	0.7	primary	13	--	13
Cobb Co. Sewer System	15.5	secondary	--	895	895
Colquitt	1.5	primary	3	24	27
Columbus	215.0	primary	--	4610	4610
Cordele	14.0	secondary	180	--	180
Cornelia	13.0	secondary	27	895	922
Cumming	13.6	secondary	63	1060	1123
Cuthbert	4.5	secondary	86	503	589
Dahlonega	3.2	primary	55	--	55
Dawson	5.0	secondary	107	545	652
Donalsonville	3.0	secondary	41	145	186
Douglasville	4.5	secondary	74	388	462
Duluth (part)	1.0	secondary	50	23	73
East Thomaston	2.7	secondary	--	332	332
Edison	2.0	primary	22	--	22
Ellaville	1.1	secondary	45	25	70
Fairburn	2.5	secondary	31	207	238
Fayetteville	1.4	secondary	55	207	262
Fort Benning	72.4	primary	--	677	677
Fort Gaines	1.3	primary	16	120	136
Gainesville	74.6	secondary	331	1950	2281
Grantville	1.2	secondary	2	27	29
Greenville	0.8	secondary	6	20	26
Griffin (part)	13.0	secondary	143	--	143
Hogansville	4.0	secondary	8	458	466
LaGrange	37.5	secondary	7	--	7
Leary	1.1	secondary	42	25	67

(1/23/62)

TABLE P-3 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	Treatment Facilities Des'd for (1,000 PE)	Type Recommended	Estimated Costs in $1,000 Sewerage	Treatment	Total
GEORGIA - Cont'd					
Leesburg	0.9	primary	24	97	121
Lumpkin	1.3	secondary	21	147	168
Marshallville	1.3	primary	65	120	185
Montezuma	4.0	primary	92	272	364
Newnan	14.0	secondary	169 4/	761	930
Norcross (part)	1.0	secondary	40	23	63
Oglethorpe	1.3	primary	41	120	161
Palmetto	1.5	secondary	26	84	110
Pine Mountain	0.9	secondary	17	22	39
Potterville	0.2	secondary	--	12	12
Reynolds	1.4	secondary	22	30	52
Richland	1.5	secondary	18	31	49
Roswell	3.0	primary	146	222	368
Sargent	1.5	secondary	35	84	119
Shellman	1.1	secondary	23	25	48
Smithville	1.0	secondary	26	23	49
Smyrna	5.0	secondary	--	87	87
Sugar Hill	1.2	secondary	59	27	86
Talbotton	1.3	secondary	58	28	86
Thomaston	12.5	secondary	--	317	317
Union City	2.1	secondary	106	270	376
Vienna	2.3	secondary	55	291	346
Villa Rica (part)	1.7	secondary	36	124	160
West Point	5.0	primary	36	324	360
Woodbury	1.5	secondary	62	31	93
Totals			7,222	28,778	36,000

*Based on January 1960 constant dollars.

1/ Includes sewerage improvements in Southwest Lanett.
2/ Includes sewerage improvements in Doraville and N. Atlanta.
3/ Includes sewerage improvements in Forest Park, Jonesboro, Lake City, Morrow, and Riverdale.
4/ Includes sewerage improvements in East Newman.

(6/1/62)

TABLE P-4
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Type of Waste	Treatment Recommended	Est. Cost of Treatment $1,000
ALABAMA				
Chambers	A	bleach & dye	primary	444
	B	bleach & dye	primary	750
FLORIDA				
Jackson	A	rendering	stabilization pond	12
	B	fertilizer	chem precipitation	140
GEORGIA				
DeKalb	QQQ	oil, paints	city sewers	--
Coweta	D	meat pkg	stabilization pond	31
	E	textile dye	stabilization pond	28
	F	acids & alk	neutralization	30
	G	bleach & dye	stabilization pond	35
	H	textile dye	stabilization pond	35
	I	textile dye	city sewers	--
Crisp	J	fertilizer	chem precipitation	20
Dougherty	L	rendering	primary	50
	Q	dairy	city sewers	--
	T	ink & glue	city sewers	--
	U	pharmaceuticals	primary	250
Gwinnett	V	rendering	additional lagoon	12
	W	tannery	secondary	950
Habersham	Z	sanitary	septic tank	5
	AA	sanitary	city sewers	--
	UU	poultry	city sewers	--
Harris	EE	poultry	stabilization pond	33
Lamar	FF	meat pkg	stabilization pond	6
Macon	GG	canning	primary	385
	HH	bleach & dye	city sewers	--
	II	bleach & dye	city sewers	--
Marion	JJ	poultry	stabilization pond	30
Meriwether	KK	canning	stabilization pond	61
	LL	textile	secondary	64
Mitchell	MM	meat pkg	stabilization pond	12
	NN	wood pres	oil removal	1
	OO	poultry	stabilization pond	35

P-25

TABLE P-4 (CONT'D)
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Type of Waste	Treatment Recommended	Est. Cost of Treatment $1,000
GEORGIA - Cont'd				
Mitchell	PP	fertilizer	chem precipitation	41
Muscogee	QQ	bleach & dye	city sewers	--
	RR	textile dye	primary	385
	SS	chemical	city sewers	--
	TT	starch	primary	23
	YY	sanitary	city sewers	--
Pike	ZZ	canning	stabilization pond	35
	AAA	canning	stabilization pond	20
Spalding	BBB	sanitary	city sewers	--
	PPP	canning	city sewers	--
Sumter	CCC	fertilizer	chem precipitation	28
	DDD	meat pkg	secondary	87
	EEE	canning	stabilization pond	54
	FFF	wood pres	chem precipitation	10
Talbot	GGG	textile dye	stabilization pond	35
Troup	HHH	bleach & dye	stabilization pond	43
	III	textile	stabilization pond	46
	JJJ	textile	secondary	1,094
	KKK	textile dye	stabilization pond	54
Upson	LLL	bleach & dye	secondary	843
	MMM	textile	city sewers	--
Total				6,217

*Based on January 1960 constant dollars.

(1/23/62)

comprehensive water quality study be initiated in the Apalachicola-Chattahoochee-Flint Basin. The object of such a study would be to gather basic data on waste loads and water quality characteristics for the purpose of determining the existing quality of ground and surface waters which could then be used to develop a comprehensive plan for water use and water quality control for the Basin. Because of the rapidly developing plans being made in the Basin, a comprehensive water quality survey should be initiated as soon as possible.

A need also exists in the Apalachicola-Chattahoochee-Flint Basin and other areas of the Southeast River Basins for research and studies to determine the effect of pollution from insecticides, pesticides, and herbicides, and methods for its control.

FUTURE POLLUTION ABATEMENT REQUIREMENTS

PROJECTIONS

Future pollution abatement needs of the Atlanta metropolitan area have been determined on a countywide basis for each of the five counties, Cobb, Clayton, DeKalb, Fulton, and Gwinnett, which will discharge wastes to the Apalachicola-Chattahoochee-Flint Basin. However, future needs have been determined individually for each of the municipalities and institutions outside the Atlanta metropolitan area.

By 1975, 102 municipalities and institutions expect to have sewage works. As shown by Table P-5, the total PE of the sewage before treatment will be 2,209,800 and the PE after recommended treatment is estimated to be 453,280.

By the year 2000, 105 municipalities and institutions are expected to have sewage works. As shown in Table P-5, the total PE of the sewage before treatment will be 4,903,900 and the estimated PE after recommended treatment will be 688,225.

As shown in Table P-6, industrial wastes discharged by 35 industries will have a total PE before treatment of 511,500 and 695,500 by 1975 and 2000, respectively. These wastes will have an estimated total PE after recommended treatment of 114,000 and 133,800 by 1975 and 2000, respectively. These figures do not include 13 industries for which waste discharges are either undetermined or of an inorganic nature. It is assumed that all other industries in the Basin will discharge wastes to subsurface systems, evaporation ponds or to municipal sewerage systems.

SEWERAGE

Assuming that sewerage requirements for 1960 will have been met, additional sewerage construction will be required in 78 municipalities between 1960 and 1975. These 78 municipalities will require extension of the sewage collection systems required for 1960 to serve an additional 622,780 persons. As shown by Table P-7, the total capital outlay required for extension of sewerage systems is estimated to be $31,065,000 to meet the needs between 1960 and 1975.

Between 1975 and 2000, there will be a need for sewerage construction in 85 municipalities. These municipalities will require extension of the sewage collection systems recommended in 1960 and 1975 to serve an additional 1,673,640 persons. As shown by Table P-7, the total outlay required for extension of the sewage collection systems required to meet the needs between 1975 and 2000 is estimated to be $83,682,000.

TREATMENT FACILITIES

The degree of treatment required at each municipality, institution, and industry has been determined on the basis of dilution water available during periods of low stream flow and/or downstream water use. In the upstream areas where low flows are not sufficient to protect water quality after secondary treatment, low flow augmentation is recommended. However, primary treatment only has been recommended for wastes discharged to tidewater. In the Atlanta metropolitan area, available data was not sufficient to determine dilution water requirements. However, because of the size of the area, and the volume and strength of the municipal and industrial wastes discharged, a minimum of secondary treatment for all wastes in the area was considered reasonable. These areas are discussed more fully in the LOW FLOW AUGMENTATION section of this memorandum.

The sewage treatment facilities recommended for 1960 in 52 municipalities will be adequate to meet the needs between 1960 and 1975. Fifty other municipalities, however, will need to enlarge either their existing treatment facilities or those recommended for 1960 to meet the needs between 1960 and 1975. One municipality will need to construct a new secondary treatment plant. Of the 50 plant enlargements recommended, 14 are for primary plants, 30 for secondary plants and 6 for stabilization ponds. The total capital outlay required for municipal sewage treatment plant construction between 1960 and 1975 is estimated to be $45,213,000 as shown by Table P-7.

Existing treatment facilities or those recommended for 1960 will be adequate to meet 1975 needs for 36 industries. However, 25 industries will need additional waste treatment facilities between 1960 and 1975. In addition, the pulp and paper mill projected for the Basin will need to construct a new secondary treatment plant by 1975. The total capital outlay required for this construction is estimated to be $3,243,000 as shown in Table P-8.

Sewage treatment facilities recommended for 50 municipalities for 1975 will need to be enlarged to meet the needs between 1975 and 2000. In addition, 17 municipalities will need to enlarge their existing or recommended 1960 plants and 3 municipalities will need to construct new plants. The total capital outlay required for municipal sewage treatment facilities needed between 1975 and 2000 is estimated to be $96,512,000, as shown in Table P-7.

The waste treatment facilities recommended for the 26 industries for 1975 will need to expand to meet needs between 1975 and 2000. The total capital outlay required for this expansion is estimated to be $1,958,000 as shown in Table P-8.

TABLE P-5
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	1975			2000		
Municipality	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
ALABAMA						
Abbeville	secondary	2,800	420	secondary	3,200	480
Ashford	secondary	1,950	290	secondary	2,600	390
Columbia	secondary	700	100	secondary	500	75
Cottonwood	secondary	1,450	220	secondary	2,600	390
Dothan (part)	secondary	17,500	2,600	secondary	28,500	4,270
Eufaula	secondary	12,500	1,870	secondary	17,250	2,600
Fairfax	primary	3,600	2,300	primary	4,700	3,050
Headland (part)	secondary	1,550	230	secondary	1,650	250
Hurtsboro	secondary	1,150	170	secondary	1,350	200
LaFayette (part)	secondary	1,450	220	secondary	1,600	240
Landale-Shawmut	primary	6,400	14,200	primary	11,800	7,500
Lanett	primary	14,500	9,400	primary	21,000	13,500
Phenix City	secondary	41,000	6,150	secondary	65,000	9,750
Riverview	primary	1,500	980	primary	1,300	850
FLORIDA						
Apalachicola	primary	2,700	1,750	primary	2,000	1,300
Blountstown	primary	2,500	1,630	primary	3,100	2,020

(6/1/62)

TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000

Municipality	1975			2000		
	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
FLORIDA - cont'd						
Chattahoochee	primary	14,250	9,250	primary	21,000	13,700
State Hospital	primary	13,000	8,450	primary	13,000	8,450
Cottondale	secondary	1,050	160	secondary	1,500	230
Malone	secondary	840	120	secondary	1,230	185
Marianna	primary	9,400	6,100	primary	20,900	13,600
Florida Sch.Boys	secondary	950	140	secondary	950	140
Sneads	primary	2,100	1,360	primary	3,400	2,200
State Farm	secondary	240	35	secondary	240	35
Apalachee Inst.	secondary	600	90	secondary	600	90
Wewahitchka	primary	1,850	1,200	primary	2,300	1,500
GEORGIA						
Albany	primary	141,850	92,000	secondary	288,000	43,200
Marine Spl. Center	secondary	2,600	390	secondary	2,600	390
Americus	secondary	24,000	3,600	secondary	106,000	15,900
South Georgia Vocational School	secondary	450	70	secondary	450	70
Arlington	primary	1,600	1,040	primary	1,800	1,170
Arnco Village	secondary	1,000	150	secondary	1,000	150

(1/23/62)

TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	1975			2000		
Municipality	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
GEORGIA - cont'd						
Atlanta Metropolitan Area						
Clayton Co	secondary	36,000	5,400	secondary	112,000	16,800
Cobb Co	secondary	145,000	21,800	secondary	300,000	45,000
DeKalb Co	secondary	185,000	27,800	secondary	417,000	62,500
Fulton Co (Chatt R)	secondary	705,000	105,500	secondary	1,170,000	175,500
(Flint R)	secondary	36,000	5,400	secondary	60,000	9,000
Gwinnett Co	secondary	17,000	2,550	secondary	77,000	11,500
Bainbridge	secondary	25,800	3,870	secondary	107,500	16,200
Baldwin	secondary	1,000	150	secondary	1,850	280
Barnesville (part)	secondary	700	100	secondary	700	100
Blakely	secondary	5,300	790	secondary	16,100	2,400
Buena Vista	secondary	2,320	350	secondary	4,430	660
Butler	secondary	1,700	250	secondary	3,500	530
Byromville	secondary	360	50	secondary	390	60
Camilla	secondary	8,300	1,250	secondary	24,800	3,700
Clarksville	primary	2,700	1,760	primary	6,500	4,200
Cleveland	primary	750	490	primary	950	620
Colquitt	primary	2,130	1,390	primary	6,000	3,900
Columbus	secondary	309,900	46,500	secondary	437,400	65,800
Cordele	secondary	18,800	2,800	secondary	39,700	5,950
Cornelia	secondary	21,800	3,300	secondary	36,900	5,550

TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1975			2000		
	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
GEORGIA - cont'd						
Cumming	secondary	14,400	2,160	secondary	20,300	3,050
Cussetta	secondary	1,150	170	secondary	3,100	460
Cuthbert	secondary	5,600	850	secondary	13,100	1,960
Dahlonega	primary	5,000	3,250	secondary	22,500	2,300
Dawson	secondary	6,600	990	secondary	15,500	2,300
Demorest	primary	1,200	780	primary	2,900	1,890
Donalsonville	secondary	4,400	660	secondary	9,000	1,350
Douglasville	secondary	7,000	1,050	secondary	22,300	3,350
East Thomaston	secondary	2,660	400	secondary	4,400	660
Edison	primary	1,200	780	primary	1,000	650
Ellaville	secondary	1,000	150	secondary	1,100	160
Fayetteville	secondary	1,800	270	secondary	3,500	530
Flowery Branch	secondary	1,000	150	secondary	1,600	240
Fort Benning	secondary	60,000	9,000	secondary	60,000	9,000
Fort Gaines	secondary	2,400	360	secondary	5,800	870
Franklin	primary	850	550	primary	1,450	950
Gainesville	secondary	84,900	12,700	secondary	124,900	18,700
Georgetown	--	--	--	secondary	1,000	150
Grantville	secondary	1,000	150	secondary	1,000	150
Greenville	secondary	750	110	secondary	750	110
Griffin (part)	secondary	17,970	2,700	secondary	33,960	5,100

(6/1/62)

TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Municipality	1975			2000		
	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
GEORGIA - cont'd						
Hampton	secondary	1,500	230	secondary	2,600	390
Hogansville	secondary	5,100	760	secondary	13,700	2,060
LaGrange	secondary	36,200	5,250	secondary	75,000	11,200
Leary	secondary	1,050	160	secondary	1,600	240
Leesburg	primary	800	520	primary	900	590
Lumpkin	secondary	1,700	250	secondary	3,500	530
Manchester	secondary	5,790	870	secondary	12,500	1,870
Marshallville	primary	1,550	1,000	primary	2,700	1,750
Meansville	--	--	--	secondary	830	130
Montezuma	primary	5,500	3,600	primary	11,900	7,750
New Holland	secondary	1,900	290	secondary	1,900	290
Newnan	secondary	22,000	3,300	secondary	55,500	8,300
Oglethorpe	primary	1,270	830	primary	1,450	950
Pine Mountain	secondary	850	130	secondary	915	140
Potterville	secondary	150	20	secondary	150	20
Reynolds	secondary	1,400	210	secondary	1,900	290
Richland	secondary	1,400	210	secondary	1,200	180
Roberta	secondary	900	150	secondary	1,325	200
Sargent	secondary	1,500	220	secondary	1,500	220
Senoia	secondary	800	120	secondary	850	130
Shellman	secondary	1,000	150	secondary	800	120

(1/23/62)

TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	1975			2000		
Municipality	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
GEORGIA - cont'd						
Smithville	secondary	830	120	secondary	1,025	150
Talbotton	secondary	1,220	180	secondary	1,310	200
Thomaston	secondary	18,300	2,750	secondary	46,200	6,900
Turner AFB	secondary	5,000	750	secondary	5,000	750
Vienna	secondary	2,250	340	secondary	3,000	450
Villa Rica (part)	secondary	3,200	480	secondary	12,900	1,940
Warm Springs	--	--	--	secondary	800	120
Warm Springs Fdn.	secondary	350	50	secondary	350	50
Waverly Hall	secondary	850	130	secondary	1,100	170
West Point	primary	7,600	4,950	primary	21,500	14,000
Woodbury	secondary	1,470	250	secondary	1,900	290
Woodland	secondary	900	140	secondary	1,300	200
Totals		2,209,800	453,280		4,903,900	688,225

TABLE P-6

SOURCES OF INDUSTRIAL WASTE - 1975 AND 2000

(Excludes industries connected to municipal sewer systems)

APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Treatment Recommended	1975 Vol. of Waste mgd	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Vol. of Waste mgd	2000 PE Untreated Waste	2000 PE Discharged Waste
ALABAMA								
Chambers	A	primary	1.180	24,400	15,900	0.980	20,500	13,300
	B	primary	3.900	48,800	31,700	3.280	41,000	26,600
	E	primary	0.068	240	50	0.057	200	40
	H	primary	0.025	240	50	0.021	200	40
FLORIDA								
Jackson	A	stabilization pond	0.004	undet	undet	0.005	undet	undet
	B	chem precipitation	1.730	--	--	2.593	--	--
GEORGIA								
Clayton	Y	chem precipitation	0.308	--	--	0.825	--	--
	B	stabilization pond	0.433	3,460	520	0.685	5,500	825
	C	chem precipitation	0.007	undet	undet	0.011	undet	undet
Coweta	D	stabilization pond	0.780	6,200	930	1.250	10,000	1,500
	E	stabilization pond	0.208	3,400	510	0.175	2,850	430
	F	neutralization	0.130	--	--	0.345	--	--
	G	stabilization pond	0.039	4,880	735	0.033	4,100	615
	H	stabilization pond	0.118	4,880	735	0.098	4,100	615
Crisp	J	chem precipitation	0.042	--	--	0.060	--	--
Dougherty	L	primary	0.003	undet	undet	0.005	undet	undet
	U	primary	2.500	undet	undet	3.770	undet	undet
Early	New[1]	stabilization pond	20.000	170,000	25,500	25.000	210,000	31,500
Gwinnett	V	stabilization pond	0.135	5,900	885	0.197	8,700	1,300
	W	secondary	0.460	31,200	4,680	0.575	39,000	5,850
Habersham	Z	septic tank	0.005	55	35	0.004	45	30
Hall	BB	secondary	0.232	2,600	390	0.197	2,190	330
	CC	secondary	0.098	460	70	0.082	390	60

(1/23/62)

TABLE P-6 (CONT'D)
SOURCES OF INDUSTRIAL WASTE - 1975 AND 2000
(Excludes industries connected to municipal sewer systems)
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Treatment Recommended	1975			2000		
			Vol. of Waste mgd	PE Untreated Waste	PE Discharged Waste	Vol. of Waste mgd	PE Untreated Waste	PE Discharged Waste
GEORGIA - Cont'd								
Harris	DD	none	0.025	--	--	0.025	--	--
	EE	stabilization pond	0.165	6,650	1,000	0.260	10,600	1,590
Lamar	FF	stabilization pond	0.008	360	245	0.013	600	390
Macon	GG	primary	0.625	31,000	1,085	1.000	50,000	17,500
Marion	JJ	stabilization pond	0.195	5,950	890	0.310	9,600	1,440
Meriwether	KK	stabilization pond	0.368	18,400	2,760	0.590	29,600	4,450
	LL	secondary	0.068	3,500	525	0.057	3,400	510
Mitchell	MM	stabilization pond	0.020	640	95	0.032	1,000	150
	NN	oil removal	0.004	undet	undet	0.006	undet	undet
	OO	stabilization pond	0.218	7,500	1,120	0.350	12,000	1,800
	PP	chem precipitation	0.236	--	--	0.348	--	--
Muscogee	RR	primary	0.975	20,000	7,000	0.820	17,200	6,020
	TT	primary	0.017	290	45	0.014	250	40
Pike	ZZ	stabilization pond	0.030	7,500	1,125	0.047	9,500	1,420
	AAA	stabilization pond	0.078	3,400	510	0.125	5,500	825
Sumter	CCC	chem precipitation	0.112	--	--	0.165	--	--
	DDD	secondary	0.026	1,570	235	0.042	2,500	375
	EEE	stabilization pond	0.500	15,000	2,250	0.810	25,000	3,750
	FFF	chem precipitation	0.003	undet	undet	0.003	undet	undet
Talbot	GGG	stabilization pond	0.029	4,700	705	0.025	3,940	590
Troup	HHH	stabilization pond	0.395	6,800	1,020	0.350	5,750	860
	III	stabilization pond	0.090	7,800	1,170	0.076	6,550	980
	JJJ	secondary	0.145	35,000	5,250	0.123	29,500	4,425
	KKK	stabilization pond	0.745	9,750	1,460	0.625	8,200	1,230
Upson	LLL	secondary	2.440	19,000	2,860	2.050	16,000	2,400
Totals			39.900	511,500	114,000	48.700	595,500	133,800

[1] Pulp and paper

(1/23/62)

TABLE P-7
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
ALABAMA						
Abbeville	14	--	14	20	14	34
Ashford	22	49	71	33	59	92
Cottonwood	25	--	25	58	25	83
Dothan (part)	176	435	611	434	650	1084
Eufaula	82	254	336	190	286	476
Fairfax	25	--	25	55	174	229
Headland (part)	11	--	11	19	--	19
Hurtsboro	5	--	5	10	--	10
LaFayette (part)	7	--	7	8	--	8
Langdale-Shawmut	41	--	41	84	103	187
Lanett	95	113	208	616	190	806
Phenix City	470	1378	1848	1200	1685	2885
FLORIDA						
Blountstown	6	--	6	30	74	104
Chattahoochee	85	306	391	270	360	630
Cottondale	10	--	10	23	103	126
Malone	42	185	227	20	--	20
Marianna	85	--	85	365	507	872
Sneads	35	42	77	65	120	185
Wewahitchka	21	--	21	23	58	81
GEORGIA						
Albany	1630	684	2314	5170	8396	13,566
Americus	281	732	1013	2605	3977	6582
Arlington	7	--	7	10	--	10
Atlanta-Metropolitan Area						
Clayton Co.	440	750	1190	3665	3680	7345
Cobb Co.	1600	3130	4730	8310	7034	15,344
DeKalb Co.	4280	3500	7780	10,740	9260	20,000
Fulton Co.	12,240	15,760	28,000	21,225	19,536	40,761
Gwinnett Co.	455	785	1240	3010	3370	6380
Bainbridge	399	1189	1588	3265	3962	7227

(6/1/62)

TABLE P-7 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
GEORGIA - Cont'd						
Baldwin	50	23	73	44	21	65
Blakely	65	--	65	365	613	978
Buena Vista	16	--	16	105	258	363
Butler	17	46	63	90	250	340
Byromville	--	--	--	2	--	2
Camilla	177	220	397	825	1242	2067
Clarksville	33	81	114	190	258	448
Cleveland	5	--	5	10	46	56
Colquitt	29	74	103	194	265	459
Columbus	4745	9000	13745	6525	5737	12262
Cordele	219	287	506	845	1505	2350
Cornelia	88	799	887	360	1159	1519
Cumming	42	50	92	295	593	888
Cussetta	58	184	242	97	258	355
Cuthbert	65	72	137	245	700	945
Dahlonega	129	76	205	650	1418	2068
Dawson	77	95	172	290	794	1084
Demorest	14	--	14	85	140	225
Donalsonville	89	136	225	230	514	744
Douglasville	126	162	288	540	1174	1714
East Thomaston	8	--	8	100	239	339
Ellaville	5	--	5	5	--	5
Fayetteville	20	42	62	85	239	324
Flowery Branch	50	23	73	30	18	48
Fort Benning	--	1800	1800	--	--	--
Fort Gaines	54	197	251	170	415	585
Franklin	42	93	135	30	78	108
Gainesville	469	480	949	2000	2418	4418
Georgetown	--	--	--	50	23	73
Greenville	--	--	--	4	--	4
Griffin	226	286	512	725	1212	1937
Hampton	--	--	--	55	115	170
Hogansville	73	92	165	295	776	1071
La Grange	268	--	268	1550	2363	3913
Leary	10	--	10	28	16	44
Leesburg	--	--	--	6	--	6
Lumpkin	17	46	63	90	240	330

TABLE P-7 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
GEORGIA - Cont'd						
Manchester	39	55	94	255	647	902
Marshallville	12	46	58	57	108	165
Meansville	--	--	--	42	20	62
Montezuma	88	67	155	320	360	680
Newnan	398	732	1130	1675	2144	3819
Oglethorpe	5	--	5	9	--	9
Pine Mountain	3	--	3	4	--	4
Reynolds	16	--	16	25	17	42
Roberta	45	22	67	21	14	35
Senoia	41	21	62	2	--	2
Smithville	5	--	5	10	--	10
Talbotton	3	--	3	5	--	5
Thomaston	205	336	541	1120	1813	2933
Vienna	8	--	8	37	127	164
Villa Rica (part)	73	176	249	357	838	1195
Warm Springs	--	--	--	40	20	60
Waverly Hall	43	25	68	13	--	13
West Point	149	55	204	695	594	1289
Woodbury	12	--	12	22	14	36
Woodland	45	22	67	20	14	34
Totals	31,065	45,213	76,278	83,682	96,512	180,194

*Based on 1960 constant dollar values.

(6/1/62)

TABLE P-8
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
APALACHICOLA - CHATTAHOOCHEE - FLINT BASINS

Location by State and County	Code	Estimated Costs in $1,000	
		1975	2000
FLORIDA			
Jackson	A	5	5
	B	142	142
GEORGIA			
Clayton	Y	45	95
Cobb	B	13	86
	C	3	4
Coweta	D	10	13
	F	28	58
Crisp	J	20	20
Dougherty	L	5	10
	U	200	250
Early	New[1]	2,380	560
Gwinnett	V	22	25
	W	50	187
Harris	EE	8	15
Lamar	FF	5	6
Macon	GG	135	230
Marion	JJ	8	34
Meriwether	KK	20	30
Mitchell	MM	3	3
	OO	10	16
	PP	37	37
Pike	ZZ	11	7
	AAA	10	9
Sumter	CCC	28	28
	DDD	27	44
	EEE	18	54
Total		3,243	1,958

[1] Pulp and paper

*Based on January 1960 constant dollars.

(1/23/62)

LOW FLOW AUGMENTATION

GENERAL

A minimum standard of water quality for fish and aquatic life is a dissolved oxygen content of not less than 4 ppm. In determining the volume of stream flow and storage required to maintain this standard, the following assumptions were used:

1. summer water temperatures;
2. minimum flows are 7 day low flows occurring once in 10 years; and
3. physical characteristics and reaeration constant of streams vary as to location, size, etc., of stream.

Minimum stream flows required at locations in the Basin where liquid wastes are discharged were calculated on the basis of the estimated PE for the years 1960, 1975, and 2000. At least primary treatment was assumed for all locations, and if the required dilution flow exceeded the actual low flow, secondary treatment was recommended. The minimum flows are shown in Table P-9. Locations requiring minimum flows of less than 1.0 cfs by the year 2000 are not included in the table.

TABLE P-9
MINIMUM FLOW REQUIREMENTS
APALACHICOLA-CHATTAHOOCHEE-FLINT BASIN

eneral Location	Receiving Stream	Water Required (cfs)		
		1960	1975	2000
ALABAMA				
Columbia[3]	Chattahoochee R	--	--	--
Dothan (part)	br-Omussee Cr-Chatt R	2.4	5.3	8.6
Eufaula[3]	Fort Gaines Reservoir	--	--	--
Fairfax[1]	Osanippa Cr-Chatt R	45.0	44.0	41.0
Lanett[1]	Chatt R	97.0	102.0	114.0
West Point, Ga.	Chatt R	7.4	12.2	34.0
Riverview[1]	Chatt R	2.2	2.4	2.1
Langdale-Shawmut[1]	Chatt R	8.3	9.4	11.0
Total for Area		159.9	170.0	202.1
FLORIDA				
Apalachicola[1]	Apalachicola R	44.6	38.8	28.8
Blountstown[1]	br-Apalachicola R	34.5	36.0	44.4
Chattahoochee[1]	Apalachicola R	139.0	206.0	302.0
State Hospital	Mosquito Cr-Apalach R	187.0	187.0	187.0
Sneads	Apalachicola R	20.2	30.2	49.0
Total for Area		346.2	423.2	538.0
Marianna[1]	Marshall Cr-Chipola R	18.5	22.5	50.1
Wewahitchka[1]	Chipola R	20.2	27.4	33.1
GEORGIA				
Albany[2]	Flint R	654.0	850.8	346.0
Marine Spl Center	ditch-Flint R	3.1	3.1	3.1
Total for Area		657.1	853.9	349.1
Americus	Muckalee Cr-Flint R	4.4	7.7	27.5
Andersonville (ind)	Sweetwater Cr-Flint R	3.0	4.5	7.5
Arlington[1]	Spring Cr-Lake Seminole	3.6	3.8	4.2

TABLE P-9 (Cont'd)

General Location	Receiving Stream	Water Required (cfs) 1960	1975	2000
GEORGIA - Cont'd				
Atlanta Metropolitan Area	(See text)			
Bainbridge[3]	Lake Seminole	--	--	--
Cedar Springs (ind)	Chattahoochee R	--	610.0	768.0
Blakely	Dry Cr-Spring Cr-Lake Seminole	1.2	1.6	4.8
Buena Vista	Oochee Cr-Flint R	1.7	2.5	4.2
Butler	Beaver Cr-Patsiliga Cr-Flint R	0.4	0.5	1.0
Camilla	Big Slough Cr-Flint R	3.0	4.9	11.3
Chicopee[3] (ind)	br-Lake Lanier	--	--	--
Clarkesville[1]	Soque R-Chatt R	2.2	3.0	7.2
Cleveland[1]	br-Tesnatee Cr-Chestatee	0.8	0.8	1.0
Colquitt	Spring Cr-Lake Seminole	3.6	5.0	14.4
Columbus[4]	Chattahoochee R	570.0	--	--
Fort Benning[4]	Upatoie Cr-Chatt R	174.0	--	--
Phenix City, Ala.[4]	Chattahoochee R	75.8	--	--
Total for Area		819.8	--	--
Cordele	Gum Cr-Flint R	3.1	5.6	11.9
Cornelia	Mud Cr-Chatt R	1.3	2.2	3.7
Cumming	br-Big Cr-Chatt R	1.4	1.4	2.0
Cuthbert	Carter Cr-Ichawaynochaway Cr	1.3	1.7	3.9
Dahlonega[2]	br-Cane Cr-Chestatee R	2.9	5.5	2.3
Dawson	Brantley Cr-Chickasawhatchee Cr	1.5	2.0	4.7

TABLE P-9 (Cont'd)

General Location	Receiving Stream	Water Required (cfs) 1960	1975	2000
GEORGIA - Cont'd				
Demorest	Hazel Cr-Soque R	1.1	1.3	3.2
Donalsonville	Fish Pond Drain-Lake Seminole	0.8	1.3	2.7
Douglasville	Gothards Cr-Sweetwater Cr	0.5	0.7	2.2
East Thomaston	br-Swift Cr-Flint R	2.2	2.1	2.0
Edison[1]	br-Ichawaynochaway Cr	2.9	2.9	2.4
Fort Gaines[3,4]	Chattahoochee R	--	--	--
Franklin[1]	Chattahoochee R	--	0.9	1.7
Gainesville[3]	Chatt-Lake Lanier	--	--	--
Georgetown	Fort Gaines Reservoir	--	--	--
Griffin (part)	Ison Br-Flint R	0.8	1.1	1.7
Griffin (part)	Shoal Cr-Flint R	0.5	0.7	1.7
Hogansville	Yellow Jacket Cr-Chatt R	4.0	4.1	4.3
LaGrange	Blue John Cr-Long Cane Cr	3.7	3.7	3.4
LaGrange	Yellow Jacket Cr-Chatt R	0.9	1.6	5.5
Leesburg[1]	Kinchafoonee Cr-Flint R	1.8	1.9	2.2
Lumpkin	Hodchodkee Cr-Pataula Cr-Chatt R	0.4	0.5	1.1
Manchester	Pigeon Cr-Flint R	0.5	0.6	1.3
Marshallville[1]	br-Flint R	3.1	3.9	6.5

TABLE P-9 (Cont'd)

General Location	Receiving Stream	Water Required (cfs) 1960	1975	2000
GEORGIA - Cont'd				
Montezuma[1]	Flint R	57.0	88.0	148.0
Oglethorpe[1]	Flint R	2.8	3.1	3.5
Total for Area		59.8	91.1	151.5
Newnan	Mountain Cr-Chatt R	0.5	0.6	1.6
Newnan	White Oak-Flint R	4.6	7.1	12.3
Newnan	Wahoo Cr-Chatt R	0.5	0.6	1.6
Arnco Village	Wahoo Cr-Chatt R	0.6	0.6	0.5
Sargent	Wahoo Cr-Chatt R	0.7	0.7	0.6
Total for Area		1.8	1.9	2.7
Pine Mountain Valley	Palmetto Cr-Mulberry Cr-Chatt R	0.4	0.7	1.1
Thomaston	br-Potato Cr-Flint R	1.3	1.8	4.6
Turner AFB	Reservoir	--	--	--
Vienna	Pennahachee Cr-Flint R	0.6	0.7	1.0
Villa Rica (part)	Sweetwater Cr-Chatt R	0.2	0.3	1.3
Woodbury	Cane Cr-Flint R	4.0	5.7	9.6
Zebulon	Elkins Cr-Flint R	0.5	0.8	1.0

[1] Primary treatment only

[2] Secondary treatment by 2000

[3] Discharge to reservoir

[4] Secondary treatment by 1975

AREAS WHERE AUGMENTATION IS NOT NEEDED

There will be sufficient volumes ot water available for adequate dilution, and no storage will be needed to maintain stream quality below the points ot waste discharge (after recommended treatment) from the following areas: Lanett, Langdale, and Riverdale in Alabama; Apalachicola, Blountstown, Chattahoochee, Marianna, and Wewahitchka in Florida; and Albany, Americus, Arlington, Camilla, Clarkesville, Cleveland, Colquitt, Dahlonega, Demorest, Edison, Franklin, Leesburg, Lumpkin, Manchester, Montezuma, Oglethorpe, Vienna, Woodbury, and Zebulon in Georgia.

AREAS WHERE AUGMENTATION IS NEEDED

In several areas, the streams receiving liquid wastes travel a short distance (1 to 5 miles) before reaching a larger stream with adequate flow. This results in polluted stream conditions for short distances downstream during periods of low flow in the following areas: Fairfax in Alabama; Sneads in Florida; and Andersonville, Blakely, Buena Vista, Butler, Cornelia, Cumming, Cuthbert, Douglasville, Hogansville, LaGrange, Marshallville, Pine Mountain Valley, Thomaston, and Villa Rica in Georgia. Storage for augmentation of low stream flow or higher degree of treatment to maintain desirable water quality in the short distances involved is not considered the most economical solution to these pollution problems. Studies of alternate solutions, such as diversion, will be needed in these areas.

Waste discharges to other areas in the Basin will present greater problems, however, and are discussed individually below:

Dothan, Alabama

Wastes from this area are discharged to both the Choctawhatchee-Perdido Basin and the Apalachicola-Chattahoochee-Flint Basin in approximately equal volumes in 1960. By 1975 and 2000, it is expected that about two-thirds of the wastes will be discharged to the Choctawhatchee-Perdido Basin. The remaining portion of the wastes will be discharged to Spring Branch of Omussee Creek. To avoid quality degradation, the wastes will require, after secondary treatment, 2.4 cfs, 5.3 cfs, and 8.6 cfs in 1960, 1975, and 2000. Augmentation of the low flow is needed but there is insufficient watershed area to provide the required storage. As a result, Spring Branch and Omusee Creek will be severely degraded during low flow approximately 10 miles to a point where the wastes become stabilized.

Atlanta Metropolitan Area

Minimum stream flows required for adequate dilution of the wastes discharged from the Atlanta area have not been determined. The available data on waste loadings, points of discharge, and physical characteristics of the streams receiving waste discharges from the many municipal and industrial sewer systems in the area is not considered sufficient for a detailed analysis of flow requirements. In addition, little is known of the effects of the present and planned flow regulation of the Chattahoochee River, and the large scale diversion of stream flow from the Chattahoochee River to the Flint and South Rivers by municipal water systems. Nor is there sufficient data to evaluate the effects of stream temperature rise caused by the return of cooling water from power plants and industries in the area.

These and other complex factors affecting water use and water quality in the area will need to be defined to determine present and anticipated future stream conditions. No adequate comprehensive appraisal of the pollution abatement needs for the Atlanta area can be made without a detailed field study of existing conditions. A discussion of the type of study needed may be found in the section OTHER NEEDS.

Cedar Springs, Georgia

The pulp and paper plant now under construction near Cedar Springs will discharge wastes after recommended secondary treatment to the Chattahoochee River at the headwaters of Lake Seminole. The extent of water degradation, if any, should be determined by further study after the plant begins operations.

Cordele, Georgia

Wastes from Cordele are discharged to Gum Creek at a point where the natural low flow is 5.0 cfs. The wastes, after secondary treatment, require stream flows of 3.1 cfs, 5.6 cfs, and 11.9 cfs in 1960, 1975, and 2000 respectively. Storage for low flow augmentation will be required to protect the water quality of Gum Creek. The required capacity of the reservoir is estimated to be 1400 acre-feet by 1975 and 4300 acre-feet by the year 2000.

Dawson, Georgia

Wastes from Dawson are discharged to Brantley Creek at a point where the natural low flow is 1.3 cfs. For adequate dilution, the wastes require, after secondary treatment, 1.5 cfs, 2.0 cfs, and 4.7 cfs in 1960, 1975, and 2000 respectively. To avoid degradation of water quality storage for low flow augmentation should be provided. The required capacity of the reservoir on Chickasawhatchee Creek is estimated to be 1150 acre-feet.

Donalsonville, Georgia

Wastes from Donalsonville are discharged to Fish Pond Drain which flows to the Spring Creek arm of Lake Seminole. For adequate dilution, the wastes require, after secondary treatment, 0.8 cfs, 1.3 cfs, and 2.7 cfs in 1960, 1975, and 2000 respectively. The natural low flow of Fish Pond Drain is 0.5 cfs and storage for low flow augmentation cannot be provided. As a result, Fish Pond Drain will be seriously degraded during periods of low flow to a point where the wastes have become stabilized.

East Thomaston, Georgia

Wastes from East Thomaston are discharged to Swift Creek at a point where there is little, if any, natural low flow. For adequate dilution, the wastes will require, after secondary treatment, 2.2 cfs, 2.1 cfs, and 2.0 cfs in 1960, 1975, and 2000 respectively. There is insufficient watershed area above the point of discharge to provide storage. As a result, Swift Creek will be polluted during periods of low stream flow for 5-10 miles.

Griffin, Georgia

Wastes from the Griffin area are discharged to both the Apalachicola-Chattahoochee-Flint Basins and the Altamaha Basin in approximately equal volumes in 1960. In the future, it is expected that wastes will be discharged to Ison Branch of Potato Creek and to Shoal Creek. During periods of low flow, there will be insufficient dilution water available in both creeks and storage for augmentation is not possible. As a result, both Potato Creek and Shoal Creek will be seriously degraded during natural low flow for 5-10 miles downstream.

Newnan, Georgia

Wastes from the Newnan area are discharged to three creeks, Wahoo Creek, Whiteoak Creek, and Mountain Creek. There will be sufficient water available in Wahoo Creek for dilution of the wastes. However, both Whiteoak Creek and Mountain Creek receive wastes near their headwaters and little or no flow is available during periods of low flow. Whiteoak Creek and Mountain Creek will be seriously degraded during natural low flow for 5-10 miles downstream.

Reservoir Areas

Wastes from Columbia and Eufaula, Alabama, and Bainbridge, Chicopee, Fort Gaines, Gainesville, Georgetown, and Turner Air

Force Base in Georgia are or will be discharged directly to reservoirs. In addition, Columbus, and Fort Benning, Georgia, and Phenix City Alabama, will discharge to the headwaters of the Walter F. George Reservoir. Secondary treatment of all such wastes has been recommended as a desirable minimum, but no attempt has been made to determine augmentation requirements. Alleviation of pollution in large reservoirs would be better accomplished by wastes dispersion through properly designed outfalls and/or a high degree of treatment.

Summary of Agumentation Needs

The areas in the Apalachicola-Chattahoochee-Flint Basin where storage for low flow augmentation is needed are shown below:

TABLE P-10
RESERVOIR STORAGE NEEDS
APALACHICOLA-CHATTAHOOCHEE-FLINT BASIN

Location	Storage Acre-Feet		
	1960	1975	2000
Dothan, Alabama	no drainage area		
Fairfax, Alabama	not economically feasible		
Sneads, Florida	not economically feasible		
Andersonville, Georgia	not economically feasible		
Blakely, Georgia	not economically feasible		
Buena Vista, Georgia	not economically feasible		
Butler, Georgia	not economically feasible		
Cordele, Georgia	--	1400	4300
Cornelia, Georgia	not economically feasible		
Cumming, Georgia	not economically feasible		
Cuthbert, Georgia	not economically feasible		
Dawson, Georgia	--	1150	1150
Donalsonville, Georgia	no drainage area		
East Thomaston, Georgia	no drainage area		
Griffin, Georgia	no drainage area		
Hogansville, Georgia	not economically feasible		
LaGrange, Georgia	not economically feasible		
Marshallville, Georgia	not economically feasible		
Newnan, Georgia	no drainage area		
Pine Mountain Valley, Georgia	not economically feasible		
Thomaston, Georgia	not economically feasible		
Villa Rica, Georgia	not economically feasible		

ANNUAL COSTS AND BENEFITS

FINANCING

Municipalities can finance sewage works construction by general obligation bonds, revenue bonds, special assessments, or some combination of these methods. The Georgia law permits the issuance of general obligation bonds to be repaid within 30 years, up to a maximum amount of 7 percent of the evaluation of taxable property within the political subdivision. The law permits an increase of this bonded indebtedness of 3 percent of the evaluation of the taxable property provided the increased indebtedness shall be repaid within a five-year period and is approved by the General Assembly.

For municipalities with a population of less than 6000, the Alabama law permits the issuance of general obligation bonds, to be repaid within 30 years, up to a maximum of 5 percent of the evaluation of taxable property within the political subdivision. For municipalities with a population of greater than 6000, general obligation bonds can be issued up to a maximum of 7 percent of the evaluation of taxable property within the political subdivision. Individual exceptions to this law have been made by the state legislature.

The Florida law permits issuance of general obligation bonds up to a maximum amount of 10 percent of the evaluation of taxable property within the political subdivision. Individual exceptions to this law have been made by the legislature.

Industries will undoubtedly finance their pollution abatement facilities with private capital by the most economical methods available to them at the time of construction.

ANNUAL COSTS FOR 1960

The annual cost of pollution abatement by municipalities and industries in the Basin in 1960 is estimated to be $3,974,250. This includes the annual equivalent capital cost of existing facilities in 1960, annual replacement, and operation and maintenance cost of existing facilities. A breakdown of the total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$2,996,000	$27,000
Annual replacement cost	0	2,550
Annual operation and maintenance cost	933,000	15,500
Total annual cost (1960)	$3,929,000	$45,250

The total capital outlay required to improve existing pollution abatement facilities to meet the 1960 needs is estimated to be $36,000,000 for 88 municipalities and $6,217,000 for 39 industries. These costs are shown in Tables P-3 and P-4.

ANNUAL COSTS BY 1975

The total capital outlay required for additional pollution abatement facilities needed by 1975 after 1960 needs have been met, is estimated to be $76,278,000 for 77 municipalities and $3,243,000 for 26 industries. These costs are shown in Tables P-7 and P-8.

The total annual cost of pollution abatement by municipalities and industries in 1975 is estimated to be $13,344,630. This includes the annual equivalent capital cost of: (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet 1975 needs. The replacement cost is based on the total investment by 1975 and the operation and maintenance cost is based on existing and recommended facilities as of 1975. A breakdown of total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$8,448,600	$486,580
Annual replacement cost	0	14,450
Annual operation and maintenance cost	4,044,000	351,000
Total annual cost (1975)	$12,492,600	$852,030

ANNUAL COSTS BY 2000

The total capital outlay required for additional pollution abatement facilities needed between 1975 and 2000 is estimated to be $180,194,000 for 85 municipalities and $1,958,000 for 26 industires. These costs are shown in Tables P-7 and P-8.

The total annual cost of pollution abatement by municipalities and industries in 2000 is estimated to be $25,581,250. This includes the equivalent capital cost, the replacement cost, and the operation and maintenance cost of existing facilities and all recommended improvements for 1960, 1975, and 2000. A breakdown of total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$17,216,230	$582,150
Annual replacement cost	0	22,370
Annual operation and maintenance cost	7,332,600	427,900
Total annual cost (2000)	$24,548,830	$1,032,420

BENEFITS

It is recognized that pollution control results in benefits to public health and to those economic activities associated with the use of water of improved quality. However, because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from improvement in quality of water now used or anticipated to be used in the future from public or private supplies in the Basin are indeterminate. While pollution abatement does enhance fishing and recreational opportunities, protect health, preserve and improve property and aesthetic values, and assure future utility of water resources, these values are confined largely to the intangible or social realm.

Ordinarily for those functions for which no market values are clearly established their values may in some cases be derived or estimated indirectly from prices established in the market for similar or analagous effects or may be derived from the most economical cost of producing similar effects by an alternative means. In the case of pollution abatement, however, there are no established prices for similar effects since no analagous effect exists. Neither are there alternative means of providing similar effects since, in most cases, the most likely, least cost means of attaining the desired effects is used. Therefore, lacking adequate methodology for assessing social values, benefits from pollution abatement must, for the time being, be considered as intangible. In the absence of established or synthetic market values, since the benefits from pollution abatement are real although intangible, it is considered that benefits accruing from pollution control by conventional treatment processes are at least equal to the cost of providing the facilities.

Since knowledge of society's future needs is less complete and accurate than information of present requirements, there could well be a tendency to adopt a water quality standard that is at times too high. Such has not been the case in the development of costs in this memorandum, however, because only minimum requirements or needs have been expanded into the future.

SUMMARY

1960

At the present time there are 104 municipalities (which include 15 institutions) and 61 industries which discharge wastes, treated and untreated, into the surface waters of the Apalachicola-Chattahoochee-Flint Basin.

The total volume of municipal and industrial wastes discharged to the waters of the Basin is estimated to be 145.9 mgd and the total PE 1,819,800 untreated and 1,273,000 after treatment.

The existing (1960) total annual cost of pollution abatement by municipalities and industries in the Basin is estimated to be $3,974,250.

1975

By 1975, 102 municipalities and institutions and 48 industries are expected to discharge wastes to the surface waters of the Apalachicola-Chattahoochee-Flint Basin. The total PE of these wastes is estimated to be 2,721,300 before treatment and 567,280 after recommended treatment.

Reservoir storage for low flow augmentation will be needed in 2 areas in 1975. In 5 areas, receiving streams will not have sufficient drainage area to allow storage for low flow augmentation and thus polluted water conditions will exist during natural low flow periods some 5 to 10 miles downstream. In 15 areas, the size and length of the receiving streams is such that low flow augmentation during periods of low flow would not be economically feasible and thus severely polluted conditions are expected to exist for short distances downstream.

The total annual cost of pollution abatement by municipalities and industries by 1975 is estimated to be $13,344,630. This total includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 needs.

2000

By 2000, 105 municipalities and institutions and 48 industries are expected to discharge wastes to the surface waters of the Apalachicola-Chattahoochee-Flint Basin. The total PE of these wastes is estimated to be 5,499,400 before treatment and 822,025 after recommended treatment.

Continued reservoir storage will be needed in 2 areas in the Basin by 2000. As in 1975, 5 areas which have insufficient drainage area to allow storage will be polluted for 5-10 miles downstream and in 15 other areas low flow augmentation will not be economically feasible and thus polluted conditions are expected to exist in localized areas.

The total annual cost of pollution abatement by municipalities and industries by 2000 is estimated to be $25,581,250. This value includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 and 2000 needs.

PH-1

PUBLIC HEALTH

INTRODUCTION

This Technical Memorandum is written with the limitation that field data were not available for all phases. Presentation of data in the subject areas of Vector Control and Solid Wastes is based upon published material and on field studies done by the Communicable Disease Center of the Public Health Service. The information is general and portions cannot be applied specifically to the Basin, but their presentation will serve as a guide to the solution of Basin problems as well as broader State and Regional problems.

For purposes of this Public Health Technical Memorandum, the populations of a number of cities and counties have been considered to be wholly within the Apalachicola-Chattahoochee-Flint Basin even though they are divided in the other Technical Memoranda for this Basin. Those included here are the Atlanta metropolitan area and Griffin, Georgia.

VECTOR CONTROL

INTRODUCTION

Vector problems and control efforts in this Basin may be subdivided into two segments -- urban and rural. In this study selected towns in the Basin over 1,000 population were grouped into the urban setting. Many Alabama and Georgia towns have modest mosquito larviciding and adulticiding programs. Most Florida counties have vector control programs centered in the towns which are primarily concerned with the control of mosquitoes, and secondarily with flies, rats, and other vectors. Most of these Florida programs are administered by the county health departments. In the rural areas, vector problems (except for 5 to 10 mile range fresh-water flood mosquitoes) are mostly associated with the activities of individuals who solve them on an individual basis. Exceptions to this are in the insect control work in the following Florida counties: Jackson, Calhoun, Gulf, and Franklin, although control efforts in these counties are centered in and around urban areas. There is a countywide typhus control program in Houston County, Alabama. Several local health departments in Georgia carry on modest countywide rodent control programs.

For long-range planning concerning land and water uses, emphasis has been given to recommendations that would result in an environment by the years 1975 and 2000 that would require only a minimum of repetitive pesticide application. This will not only minimize the cost of vector control programs to the public but will make them more effective.

EXISTING VECTOR PROBLEMS

Eastern encephalitis ("sleeping sickness") has caused serious losses among horses in the Basin. Mosquito vectors of this highly fatal human and horse disease are most prevalent in the swamps and marshes located close to and along the coast.

In recent years, primary local malaria transmission has been at extremely low levels. Alabama reported only one likely case in 1960. The number of malaria mosquitoes, *Anopheles quadrimaculatus*, remains about the same in the Basin as in years when malaria was prevalent. Travelers may bring malaria parasites back to this country from malarious areas of the earth, and cause malaria transmission in the Basin. Thus a continuance of mosquito control efforts coupled with surveillance will be required for many years. Fresh-water pools and ponds with vegetation are favorite breeding places for malaria mosquitoes.

Typhus fever (flea-borne) was also a severe problem in Alabama, Georgia, and Florida during the 1930's and 1940's. During recent years improved sanitation practices (limiting the domestic rat's food and harborage) and the use of newer rat poisons and flea insecticides have reduced transmission of typhus fever to low levels. Only a few cases occur each year in Georgia, Florida, and Alabama. The pest control industry has played an important role in halting typhus transmission in the urban setting. Most of the remaining transmission of this disease appears to take place in rural areas.

There is considerable transmission of various enteric infections by houseflies. Determination of precise case rates is difficult because of many factors, including poor reporting, difficulties of diagnosis, and many patients not seeking medical help.

Rocky Mountain spotted fever occurs occasionally in Alabama, Georgia, and Florida. Increased use of recreational areas and construction of suburban housing areas appear to increase the possibility of American dog ticks transmitting Rocky Mountain spotted fever to humans. It is noteworthy that in eastern United States the incidence of this disease has been highest among vacationists and picnickers, particularly among women and children.

Conjunctivitis (pink eye), a common disease of younger children, is a considerable problem in the non-coastal portions of the Basin and is confined largely to rural areas. One mode of transmission of this disease is by eye gnats (Hippelates). Oviposition of these insects occurs in freshly cultivated or otherwise disturbed soil.

The coastal area of this Basin with extensive tidal marshlands is notorious for biting insects. Salt-marsh mosquitoes and dog flies, Stomoxys calcitrans, occur in large numbers and cause great annoyance to the residents and visitors. At times these insects occur in such overwhelming numbers that outdoor activities during the day or night are practically impossible. Large broods of salt -marsh mosquitoes frequently occur following unusually high tides or heavy rains. Peak populations of dog flies usually occur in August through October. After a long period of relative freedom from annoyance, a heavy influx of dog flies suddenly appeared at all beaches from Apalachicola to Pensacola at about 10:00 A.M. on August 30, 1960. At about the same time, the wind shifted to the north after blowing from the south for several days. The principal breeding place of the dog flies has been believed to be in bay grasses thrown up on the shores of bays. Control program personnel spray DDT on these grasses in order to kill the larvae.

Fresh-water swamps, marshes, and low-lying areas that receive floodwater are also important sources of mosquitoes.

Sand flies, deer flies, horseflies, and other biting insects occasionally occur in great numbers causing extreme annoyance to residents and visitors.

Throughout the Basin, numerous small patches of alligatorweed and water hyacinths are found in the small ditches and drainage creeks. Water hyacinths are prevalent in Lake Seminole and the Flint River near Albany. Both of these obnoxious weeds were introduced to the United States from tropical areas and are spreading except in places where control work is being effected. Profuse growths of weeds tend to clog drainage ditches, canals, ponds, etc., creating conditions favorable for malaria mosquitoes especially in the Florida portions of the Basin. There are Federal programs which plan for the eradication of obnoxious weeds.

In urban areas, vector problems are frequently associated with improper disposal of sewage. Severe Culex mosquito problems have developed where communities discharge improperly treated sewage wastes into swampy or impounded areas near town. In about 15 percent of the towns studied, overflowing septic tanks are a problem, and create ideal places for the breeding of Culex mosquitoes. Sewage stabilization ponds are beginning to appear in the Basin and could cause mosquito breeding problems unless they are properly operated and maintained free from weeds.

Housefly, rodent, and roach problems in cities and rural areas are usually associated with inadequate refuse storage and disposal practices. In addition, many business and residential lots are littered with garbage, tin cans, bottles, tires, worthless lumber, and other discarded junk. Refuse collection schedules in urban areas are usually adequate. Daily service in business areas and twice weekly service in residential areas is needed for effective vector control. Many towns, however, have only a weekly pick-up service in residential areas. A few of the larger counties have countywide refuse collection systems. Refuse disposal practices are deficient in many portions of the Basin. Illegal dumping along county roads was mentioned as a problem by several directors of sanitation.

About 25 percent of the homes in the urban areas do not meet minimum sanitation standards and thus have associated fly, rat, and mosquito problems. Local directors of sanitation are aware of vector problems in substandard housing and the need for corrective programs. Fulton County, Georgia has about 35 to 40 rat bite reports per year, all reported from substandard homes (rodent control efforts have reduced this rate from 80 per year for the past several years).

One local health department sanitarian reports considerable sanitation and vector troubles with "shell" homes. Housing programs are needed in all the towns of the Basin.

Culex mosquitoes and roaches breed in catch basins in towns. Metropolitan Atlanta has thousands of catch basins which can breed mosquitoes unless treated by the County Health Department spray crews. St. Louis encephalitis was caused in Louisville, Kentucky essentially by Culex mosquitoes breeding in catch basins. Management of water in rural areas gives rise to a variety of insect vector problems. Inadequacies of general drainage construction and maintenance contribute to mosquito breeding. Most small creeks, canals, and drainage ditches receive little or no maintenance. Frequently, individual farmers and towns are not able to construct the small drainage ditches necessary because of the lack of or clogging of the large drainage canals in the county system.

Recently increased construction rates of large impoundments are viewed with concern by State departments of health with regard to possible encephalitis transmission. Of particular concern is the large, shallow water reservoir in which aquatic vegetation and mosquitoes could grow profusely.

There are numerous farm ponds in this Basin and many more are being constructed each year. Mosquito breeding in farm ponds in Georgia and Alabama portions of the Basin has not been serious due to the present construction and operating procedures. Farm ponds in Florida seem to have more aquatic vegetation and suitable environment for mosquito breeding. Several local health department directors of sanitation stated that most farm ponds in their areas were constructed in low swampy areas that formally bred many fresh-water flood mosquitoes and that the construction of farm ponds has reduced mosquito annoyance in the area by changing mosquitoes from fresh-water flood species to permanent fresh-water species.

Irrigation (sprinkler type) is increasing, and is used for such crops as tobacco, corn, and for pastures. No significant mosquito problems have developed from the proper application of irrigation water to the fields.

Local sanitarians report the existence of many wastefully flowing artesian wells. Known mosquito production associated with artesian wells has not been heavy.

Vector problems associated with land resource activities also include those related to the production of livestock and poultry. Hog parlors are beginning to spring up all over the

Southeastern States. A common practice is to wash waste accumulations from the concrete floors of the parlors to an open septic tank. The overflow often discharges into the nearest low, swampy area. This method of disposal frequently causes extensive housefly breeding. Hog parlors also may have considerable rat infestations.

Chicken "factories" are also found in the Southeast and large numbers are found in this Basin. In egg factories, the birds are usually kept in small elevated cages, beneath which cones of manure accumulate on dirt floors. Major fly and rodent problems frequently develop where there is poor housekeeping. In another type of egg and chicken factory, the chickens are kept on a deep bed of wood shavings which is removed only occasionally. Waste chicken feed from a power conveyor and water wastage plus the accumulation of manure creates a favorable breeding place for flies. One chicken factory in Alabama has been screened by the operator and this has greatly reduced the fly problem.

Solid waste material (principally manure) on farms is being produced in increasing amounts and requires frequent spreading on fields for sanitary disposal without creating a fly problem. The spreading of such wastes on fields at frequent intervals may be difficult due to crop growing requirements and manpower requirements.

Many fire ant mounds were noted in the lower portion of the Basin and several counties have or have had chemical control programs. Fire ant stings are severe and have caused a few human deaths. Local sanitarians in this Basin report the occurrence of many stings in their counties. The mounds are not only unsightly but detrimental to agricultural operations. Wildlife and water supplies however must be protected in chemical control programs.

STATUS OF EXISTING PROGRAMS

There is no statewide enabling legislation for the establishment of mosquito or vector control districts in Georgia or Alabama, although local governmental units have authority by State law to conduct mosquito control work. Adequate legislation of this nature does exist in Florida.

Georgia, Alabama, and Florida all have specific health regulations pertaining to the impounding of water. Permits are issued for the construction of farm ponds built to comply with State Board of Health regulations. As of February 1961, the Alabama State Department of Health had records of 13,580 farm ponds in the State.

Supportive services for vector control operations include:

1. Surveillance. Health agencies are concerned with a continuing analysis of vector problems to guide the efforts of other activities.

2. Research. The Florida State Board of Health has a large Entomological Research Center at Vero Beach, Florida which is working on the control of insects affecting human health. Research on vector control is also being carried on at two Federal stations in the Southeast--the Orlando, Florida Laboratory of the Entomology Research Division (USDA) and the Technical Development Laboratories of the Communicable Disease Center (PHS), Savannah, Georgia. In Pensacola, Florida, the Public Health Service, in cooperation with the involved State and local health departments, is attempting to eradicate the yellow fever mosquito, _Aedes aegypti_. Now in its third year of operation, the project is making excellent progress toward the eradication goal. Public education, environmental sanitation, and DDT residual premises spraying methods are being utilized.

3. Technical assistance. Health agencies provide technical assistance to construction and operating agencies in planning and carrying out vector control operations. Local sanitarians give technical advice and assistance to local communities and to individuals.

Present vector control programs in the Florida portion of the Basin consist of four countywide vector control programs centered in health departments. Operations are centered on sanitary landfilling, bay beach larviciding for the control of dog flies, and ditching and adulticiding for the control of mosquitoes.

In the Georgia and Alabama portions of the Basin, vector control programs consist of several city mosquito control programs and several countywide typhus and rodent control programs. Most of the city mosquito control activities are given over to adulticiding measures.

Extensive studies on rat problems in Grady, Thomas, Brooks, and Decatur Counties (Georgia) have been made in recent years by the Public Health Service. These studies indicate the many economic and disease prevention values of countywide rodent control programs.

Several military bases are located in this Basin. All of them have vector control programs.

Mosquito control programs are also operated on several large power reservoirs by Federal, State, and local agencies. The principal control measures include the use of contract airplanes to spray DDT when _Anopheles quadrimaculatus_ mosquito counts or biting annoyance reaches significant levels. Portions of each reservoir are treated every few days beginning in late spring and continuing until about October 15.

EXISTING NEEDS

There is a need for more emphasis to mosquito larviciding and permanent control measures. Each county needs at least one dragline for mosquito work. Each city in the district should have from one to several year-round mosquito control workers who would inspect for larvae during the mosquito season, apply larvicides to mosquito breeding areas, operate adulticiding machines occasionally when large mosquito infestations occur,and do maintenance and minor ditch construction during winter months.

Legislative and regulatory needs include (1) State enabling legislation permitting the establishment of tax-supported vector control districts in any county of Georgia or Alabama; and, (2) Regulations to require the control of wasteful flow from artesian wells.

Needs pertaining to surveillance and technical assistance include:

1. Extensive surveys of vector disease occurrence and vector problems.

2. Increased training of local health department personnel in vector control intelligence.

3. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and related land resource development.

Some of the major research needs include:

1. Development of better permanent control techniques in salt marshes that will control mosquitoes, sand flies, and other vectors and at the same time be helpful to other interests, such as wildlife conservation.

2. Development of better equipment and methods for constructing and maintaining water management ditches.

3. Improved methods for the sanitary handling of manure and other wastes on livestock and poultry farms including the possible use of stabilization ponds for the disposal of wastes and for irrigation and fertilization.

4. Construction of new catch basins in such a manner that they do not hold water.

5. Development of new or modified chemical formulations which would overcome insecticide resistance problems and present less danger to water supplies.

6. Development of improved equipment and application techniques for chemical control of vectors in urban areas.

Vector control program needs include:

1. Establishment of vector control districts in Gulf and Franklin Counties, Florida. A system of contiguous mosquito control districts will be needed to efficiently and economically control salt-marsh mosquitoes, dog flies, houseflies and other vectors in the coastal areas. Each district will eventually need about 3 draglines for permanent control work.

2. The expansion of mosquito control programs on large power reservoirs.

3. The development of countywide water management systems and programs.

4. Extension of the use of sanitary landfills to all towns and counties in the Basin. Many low lands exist in the Basin that could be filled profitably using the sanitary landfill method.

5. Further development of countywide refuse collection systems.

6. Increased implementation of Federal programs by State and local interests to eradicate infestations of alligatorweed, and water hyacinths and other obnoxious weeds in the Basin.

7. Cooperation with State highway departments in the design of borrow pits to provide better drainage.

State aid to organized mosquito control agencies in Florida has proven very successful. State aid in Florida includes funds, supplies, services, and equipment. Sanitary landfill operations also come under the State aids program and have been most instrumental in starting and continuing these fills in Florida. Similar State aid funds and technical assistance are needed to solve the problem in Alabama and Georgia.

In order that vector control programs be compatible with multipurpose functions, it is essential that there be coordination between all interests concerned.

POTENTIAL PROBLEMS AND SOLUTIONS

Based on present knowledge, the one vector problem that appears to be on the rise and could be a significant one in the Basin is mosquito-borne encephalitis -- both the Eastern and St. Louis strains. Eastern encephalitis has caused serious losses among horses in the Basin. Sooner or later it could cause epidemics among man, as occurred in New Jersey in 1959 (this constituted New Jersey's first confirmed human cases, even though it had killed horses there for at least 50 years). The Eastern disease occurs principally in areas with vast fresh-water swamps and salt marshes (Coastal Plain).

St. Louis encephalitis -- a human disease - is not known to have occurred in the Basin, but it has recently been reported in Pinellas County, Florida. This disease presents a threat to communities in the Basin that allow uncontrolled production of Culex mosquitoes.

On the basis of current knowledge concerning mosquito-borne encephalitis, the only feasible approach to control of the disease is a program of prevention -- mosquito control for the community (or population groups) and protection against mosquito bites for the individual.

Increases in transmission of enteric infections by houseflies could increase due to changes in agricultural practices together with further "suburbia" developments.

COSTS AND BENEFITS

The principal benefit of any well-organized vector control program is to provide adequate safeguards to the public health. This includes freedom of disease and infirmity which is difficult to evaluate in dollars. Recent research studies have shown, especially in small children, that permanent brain and motor damage frequently result from cases of mosquito-borne encephalitis. The prevention of just one death or case of permanent damage would amply justify the amount of money proposed for vector control work in any one of the towns or counties in this Basin.

Additional benefits of vector control programs would be an acceleration of development and use of waterfront land. It is common knowledge that excessive numbers of salt-marsh mosquitoes, sand flies, dog flies, and other vectors on such land are an impediment to industrial plants, subdivision developments, and recreational areas.

Another benefit would be to provide economic safeguards, particularly with reference to tourism or resort areas. This is exemplified by the 1959 outbreak of Eastern encephalitis in New Jersey. Although this outbreak involved only 33 human cases with 21 deaths during a 2-month period, it was estimated that the episode caused a loss to Atlantic City hotels of $2,000,000.

The estimated costs of needed vector control programs are included in Table PH-1. Studies in the Chatham County, Georgia area have shown that the total cost of the mosquito control program is being substantially balanced by reduced costs to families in the purchase of household sprays, aerosol bombs, and repellents.

The estimated costs of rural rat control programs will be balanced several times by savings from rat damage to stored farm products.

TABLE PH-1
VECTOR PROBLEMS AND PROGRAMS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASIN

Location and 1960 Pop.	Vector Problem Degree			Approximate Annual Costs of Vector Control Program*		Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
	1	2	3	Present	Needed				
ALABAMA									
Abbeville 2,525		F R	M T	$400	$ 5,000	Open dump	Light	Light	Flea problems
Ashford 1,510		F	M R T	See Houston County		Modified sanitary landfill	Light	Light	
Dothan 31,440		M F R T		See Houston County		Modified sanitary landfill	Severe	Severe	
Eufaula 8,360	F	M R	T	None	15,000	Open dump	Severe	Light	Flea problems
Fairfax 3,100		R	M F T	200	5,000	Open dump	Moderate	Moderate	
Headland 2,650			M F R T	None	5,000	Open dump	Light	Light	
Lafayette 2,600		F	M R T	600	5,000	Open dump	Light	Light	

TABLE PH-1 (CONT'D)

Location and 1960 Pop.	Vector Problem Degree 1	Vector Problem Degree 2	Vector Problem Degree 3	Approximate Annual Costs of Vector Control Program * Present	Approximate Annual Costs of Vector Control Program * Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
ALABAMA - cont'd									
Lanett 11,700		M R	F T	$750	$10,000	Open Dump	Moderate	Light	
Langdale 2,528		F R	M T	200	5,000	Open Dump	Light	Light	
Phenix City 27,600	F	R M	T	None	25,000	Modified sanitary landfill	Light	Light	Small flea control program with service charge
Shawmut 1,898			M F R T	200	5,000	Open Dump	Moderate	Light	
Houston County 50,718		M R F	T	23,000	40,000				
FLORIDA									
Altha 413		M F	R T	See Calhoun County below		Open Dump	Moderate	Light	
Apalachicola 3,099		M R	F T	See Franklin County below		Modified landfill	Light	Moderate	Have sand fly problems

TABLE PH-1 (CONT'D)

Location and 1960 Pop.	Vector Problem Degree 1	2	3	Approximate Annual Costs of Vector Control Program * Present	Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
FLORIDA - cont'd									
Blountstown 2,375	M F		R T	See Calhoun County below		Open dump	Moderate	Severe	
Marianna 7,152		F R	M T	See Jackson County below		Open dump	Light	Light	
Wewahitchka 1,436		M F	R T	See Gulf County below		Modified landfill	Light	Light	
Calhoun County 7,422				$ 8,500	$ 10,000				Eye gnats and fire ants are severe problems
Franklin County 6,576				See Ochlockonee Basin Technical Memoranda		Has countywide modified S.L.F.			Vector program costs include S.L.F. operations
Gulf County 9,937				45,000	60,000				Vector program costs include S.L.F. operations
Jackson County 36,208				2,000	20,000				
Liberty County 3,138				See Ochlockonee Basin Technical Memoranda					

TABLE PH-1 (CONT'D)

Location and 1960 Pop.	Vector Problem Degree			Approximate Annual Costs of Vector Control Program*		Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
	1	2	3	Present	Needed				
GEORGIA									
Albany 55,890		M	F R T	$ 8,000	$10,000	S.L.F.	Severe	Moderate	
Austell 1,867			M F R T	See Cobb County		Open dump	Light	Light	
Clarkesville 1,352		M F R T		None	5,000	Open dump	Moderate	Moderate	
Columbus 116,779		M F	R T	See Muscogee County		S.L.F.	Moderate	Moderate	
College Park-East Point-Hapeville		M R	F T	See Fulton County		S.L.F.	Light	Light	
Cornelia 2,936		M F R T		None	5,000	Modified landfill	Moderate	Moderate	
Demorest 1,029		M F R T		None	5,000	Open dump	Moderate	Moderate	

TABLE PH-1 (CONT'D)

Location and 1960 Pop.	Vector Problem Degree			Approximate Annual Costs of Vector Control Program *		Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
	1	2	3	Present	Needed				
GEORGIA - cont'd									
Lake Worth				$ 3,500	$ 25,000				Mosquito control program operated by Georgia Power Company
Griffin 10,868	F	M R	T	None	10,000	S.L.F.	Moderate	Light	
Lake Bartlett				8,700	25,000				Mosquito control program operated by Georgia Power Company
Lake Black-shear				7,000	25,000				Mosquito control program operated by Crisp County Power Authority
Lake Seminole				27,540	50,000				Mosquito control program operated by U. S. Army Corps of Engineers
Lake Sidney Lanier				2,930	25,000				Mosquito control program operated by U. S. Army Corps of Engineers
Marietta 30,100		F R	M T	See Cobb County		S.L.F.	Light	Light	
Smyrna 10,157			M F R T	See Cobb County		S.L.F.	Light	Light	

TABLE PH-1 (CONT'D)

Location and 1960 Pop.	Vector Problem Degree 1	2	3	Approximate Annual Costs of Vector Control Program* Present	Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
GEORGIA - cont'd									
Muscogee County 158,623				$ 10,000	$20,000	S.L.F.			Ft. Benning - Muscogee and Chattahoochee Counties served by S.L.F.
Cobb County 114,174				2,000	4,000				
Fulton County 556,326		M F R	T	115,000	230,000	1 incinerator (700 ton capacity) and four modified landfills	Light	Moderate	1 incinerator (700 ton capacity and 1 landfill proposed

(Fulton County Health Department's vector program is countywide and covers all towns including Roswell (2,983), Atlanta (487,455), East Point (35,633), College Park (23,469), Red Oak (1,000), Union City (2,118), Fairburn (2,470), and Palmetto (1,466). Vector problems in Fulton County vary very little between these towns.)

*Costs of refuse collection and disposal are not included in this table.

1 - Severe
2 - Moderate
3 - Light

M - Mosquitoes
F - House flies
R - Rats
T - Ticks

AIR POLLUTION

PROBLEMS

Air pollution in the Apalachicola-Chattahoochee-Flint Basin originates chiefly from industry in the Georgia portion of the Basin. Approximately 45 industries are known to contribute some pollution to the atmosphere with 30 of these located near Columbus and Atlanta. Of chief importance among these industries are the wood products mills, metal plants, chemical plants, stone crushing operations and asphalt plants. Odors and smoke produced by partial burning of garbage and refuse on city dumps (not an approved method of disposal) also contribute to the problem.

Industries in the Basin release dust, gas, smoke, fly ash, odors, and particulate matter to the atmosphere and cause discomfort and contribute to health problems of individuals having respiratory troubles.

According to information available there are no major air pollution sources in Alabama and only two significant chemical plants producing dusts and fumes in Jackson County, Florida.

STATUS OF EXISTING PROGRAMS

Public Law 159-84th Congress, and its amendments, provide for "Federal technical services and financial aid to State and local government air pollution control agencies and other public or private agencies and institutions in the formulation and execution of their air pollution abatement research programs." The Surgeon General may (1) encourage cooperative activities by State and local governments for the prevention and abatement of air pollution, (2) collect and disseminate information relating to air pollution and the prevention and abatement thereof, (3) conduct investigations and research and make surveys, and (4) prepare and publish reports and make appropriate recommendations with regard to the control of air pollution.

The Alabama, Georgia, and Florida Departments of Public Health cooperate with the Public Health Service in the National Air Sampling Network Program. Urban network sampling stations in the Basin are located at Atlanta and Columbus. Others operate just outside the Basin at Augusta, Macon, Savannah, Birmingham, and Mobile.

The Florida State Board of Health has recently completed a survey of sources of air pollution and has published "A Report on Florida's Air Resources." The 1957 Florida Air Pollution Control Act established an Air Pollution Control Commission in the State Board of Health and provided for that administrative organization to enforce air pollution control rules and regulations. The Act provides for the establishment of air pollution control districts, but as of the present, none are operating in the SERB area. This State survey report, plus adequate enabling legislation for local zoning and air pollution control programs, provides a sound basis for carrying out an effective and active program in Florida.

The 1940 Code of Alabama, as amended, authorizes county boards of health to abate nuisances. The State Board of Health, under this Code, may declare certain things, acts or conditions to be public nuisances and a menace to public health. Air pollution control thus operates under the authority of this code.

The Industrial Hygiene Service, Georgia Department of Public Health, has maintained records of complaints on industrial air pollution problems since 1945. Control measures used have consisted of investigation of these complaints, and where justified, discussion with the offending parties to work out a solution to the problem. Work is underway by the Public Health Service and the State Department of Public Health on a statewide survey to locate all sources of air pollution in Georgia. The survey began in January 1961 and as of April 1962 a preliminary draft had been prepared.

EXISTING NEEDS

Available data indicate the need for control of sources of air pollution in the Basin. Additional data are needed from the three States. Most of the available data in all of the Basin are for industrial sources of air pollution. There is a need to determin the extent of air pollution from municipal, commercial, and private air polluters. The burning of garbage and refuse on dumps is common practice in most of the smaller communities and is a major source of air pollution.

The measurement and identification of sources of air pollution by statewide surveys is urged. Results of the statewide surveys form a sound basis for industrial zoning, a tool which should be used in developing and planning abatement of air pollution in the Basin.

POTENTIAL PROBLEMS AND SOLUTIONS

It is believed that industrial development and municipal growth in the Basin will increase each year contributing increasing pollution to the atmosphere. Chemical and paper & pulp industries are the major industries expected to expand production during the period 1960-2000. Measures should be considered for correcting air pollution from municipal, commercial and private sources. This would call for meteorological studies as an aid to zoning and planning functions, the preparation of air quality guides, and eventually the establishment of air pollution emission criteria for logical air basins.

(5/15/62)

Research has produced methods and devices to eliminate gases, smoke, and particulate matter from the atmosphere. New industry should be required to install air pollution abatement devices and measures should be adopted now to control present polluters of the atmosphere.

Recommendations in "Florida's Air Resources" point out the solution to their State's air pollution problems as:

1. Adoption of legislation to permit and foster establishment and operation of county and multi-county air pollution control programs throughout the State.

2. Review and approval of plans for construction and alteration of establishments which may cause air pollution.

3. Enabling legislation to permit county-wide zoning.

4. Adequate staffing and financing to carry out a program of surveillance, control, assistance, and research in air pollution.

COSTS AND BENEFITS

The cost of control of air pollution cannot be evaluated since specific quantity and quality information is not available for the sources.

Benefits to be derived from air pollution abatement result from reduction in nuisances, effects on public health, and decrease in maintenance costs of buildings and of personal property. Benefits are considered to be equal to costs of air pollution control.

RADIOLOGICAL HEALTH

PROBLEMS

The radiological health problem is best determined by considering all of the following sources of radiation: air, water, milk and food, and local sources such as medical and environment. The total effect of these sources is not known for the Apalachicola-Chattahoochee-Flint Basin.

There are two nuclear reactors located in the Basin and 44 licensed radioisotope users in Albany, Metropolitan Atlanta, and West Point, Georgia. These may produce liquid, solid, and gaseous wastes that must be disposed of to conform with criteria established by State and Federal authorities.

Data collected by State and Federal agencies on the radiological quality of the waters in the Basin are presented in Table PH-2.

STATUS OF EXISTING PROGRAMS

The Florida Board of Health collected 3500 statewide water samples for radiological analysis during the period March 1958 to October 1960. The sampling program includes surface and ground water sources with permanent sampling stations on each watershed in the State. Progress Report Number 4 of the Florida State Board of Health summarizes radioactivity in water as follows:

"1. During the interval March 1958 to October 1960, 1209 samples were collected from Florida's 20 watersheds with 3500 separate analyses being performed.

2. A marked decrease in radioactivity of surface waters and rainfall became apparent in the late spring of 1959 and continued until the French weapons testing in February 1960. Activity from this testing dropped after May 1960 and continues to be undetectable."

The National Air Network operates stations at Columbus and Atlanta which collects data on radioactivity in the atmosphere.

Other activities of the States include maintenance of a list of Atomic Energy Commission licensed isotope users. In addition, Florida surveys sites for industrial users.

(5/15/62)

TABLE PH-2
RADIOACTIVITY IN WATER
APALACHICOLA - CHATTAHOOCHEE - FLINT BASIN

Sampling Station	Period of Analysis	No. of Samples	Gross Alpha - uuc/1			Gross Beta - uuc/1			Remarks
			Ave.	Max.	Min.	Ave.	Max.	Min.	
Alabama Surface Waters									
Phenix City Water Intake Chattahoochee River	1958-60	12	1.3	3.9	0.3	13.3	43.4	4.5	
Chattahoochee River Bridge on U. S. 84	1958-60	17	0.9	1.8	0.0	9.0	20.1	0.5	
Florida Surface Waters									
Apalachicola River at Blountstown Bridge, Highway 20	1959-60	2	0.8(1)	-	-	5.6	9.6	1.7	
Chipola River near Dead Lake, Wewahitchka	1959	1	1.5	-	-	315.0	-	-	
Chipola River near Clarksville	1959-60	4	0.7	0.8	0.6	40.0	114.9	1.7	
Chipola River at Wewahitchka above entrance Apalachicola R	1959	1	-	-	-	1.6	-	-	
St. Georges Island off Apalachicola River	1959	1	-	-	-	16.0	-	-	
Apalachicola River at Jim Woodruff Dam	1958	1	-	-	-	14.0	-	-	
White City Canal	1958	2	-	-	-	21.3	34.0	8.7	
Sink Creek - Jackson - Calhoun County Line	1958	1	-	-	-	2.7	-	-	

TABLE PH-2 (CONT'D)

Sampling Station	Period of Analysis	No. of Samples	Gross Alpha - uuc/1			Gross Beta - uuc/1			Remarks
			Ave.	Max.	Min.	Ave.	Max.	Min.	
Florida Surface Waters - cont'd									
St. Joe Water Works - Canal	1958	3	0.1(2)	0.14	0.1	12.4	20.0	4.2	
Merritt Mill Pond	1958	2	0.2(1)	--	-	7.4	9.1	5.7	
Compass Lake - S.E. Shore	1958	2	-	--	-	28.0	41.0	15.0	
Apalachicola River at Blountstown	1958	1	0.12	--	-	6.3	-	-	
Blountstown Lake	1958	1	0.12	--	-	7.8	-	-	
Apalachicola R @ Chattahoochee	1959-60	13	0.0 (5)	0.0	0.0	0.5	2.0	0.0	
Florida Ground Water									
Apalachicola	1958	1	--	--	-	5.0	-	-	Deep well
Cottondale	1959-60	2	0.8	1.6	0.1	0.2(1)	-	-	Deep well 490' deep
Marianna	1959-60	3	0.3(1)	--	-	9.1	10.4	8.0	Shallow well 20' deep
Marianna Well No. 3	1958	1	0.1	--	-	1.3	-	-	Deep well
Indian Pass S/D	1957	1	--	--	-	1.0	-	-	Deep well 420' deep
Georgia Surface Water									
Atlanta Water Intake	1960	12	0.2(5)	1.0	0.0	0.1	1.0	0.0	
Columbus Water Intake	1959-60	32	0.8(12)	5.0	0.0	1.6	12.0	0.0	
Flint River near Griffin	1960-61	3*	3.4	8.6	0.0	3.9	5.2	2.2	
Flint River near Montezuma	1960-61	3*	2.4	4.9	0.0	3.1	5.2	2.0	
Flint River at Albany	1960-61	3*	3.8	9.9	0.0	3.3	5.2	2.1	
Chattahoochee River near Franklin	1960-61	3*	9.5	27.0	0.0	4.0	5.2	3.3	
Chattahoochee R at West Point	1960-61	3*	2.0	4.6	0.0	3.5	5.2	2.0	

*Weekly composite samples. Collected by PHS during field studies conducted for the USSC.

Note: Number in parenthesis shows number of analyses upon which the average was computed if different than total number of analyses.

There are limited radiological health programs operating in the Basin by the Florida and Alabama Departments of Public Health. The National Water Network Stations in the Basin are located at Atlanta and Columbus, Georgia and Chattahoochee, Florida. The Georgia Department of Public Health plans a surface water monitoring program to gather data on radioactivity in the State's streams.

The Public Health Service is expanding its water quality National Network program and present plans are to locate other sampling stations in Georgia, Florida, and Alabama.

EXISTING NEEDS

The air phase of surveillance has never been undertaken by the States due to lack of funds, personnel, and equipment. Development of this phase of the program is increasingly important.

The Alabama and Georgia Departments of Public Health need funds and personnel to expand their water and air monitoring programs. Assistance also is needed to further the surveillance programs for milk and foods in Alabama and Georgia.

There is also need for programs to assure the control of health hazards associated with the use and disposal of radioisotopes wastes.

POTENTIAL PROBLEMS AND SOLUTIONS

It is expected that the use of radioisotopes will increase in the future. Control of their use is a State responsibility. Funds and personnel should be made available that will permit the States to have a balanced and effective program.

Solutions to future problems include the following:

1. Enactment of specific State legislation to control radioactive pollutants and license isotope users.

2. Provide additional funds and personnel for statewide programs of control, and monitoring of air, water, milk, and food.

SOLID WASTES

INTRODUCTION

Most communities collect and dispose of solid wastes as a governmental service, financing the operation by general taxation or by a special service charge. In a few instances, the collection and disposal is left to the individuals producing the waste or to private collectors who charge a fee for the service.

Methods of disposal vary, including dumping (and burning) on the surface, placing in sanitary landfills, and incineration. The amount of waste produced on a national average is 0.8 to 1.0 cubic yard or about 650 pounds per person per year (approximately 2 pounds per person per day).

Incineration is considered as one of the best methods of disposal. However, it requires a sufficiently large population to support an economical operation. For purposes of this Technical Memorandum, incineration is recommended for urban areas of 50,000 population or more.

Sanitary landfills are the best method of waste disposal for any small community having suitable land available within reasonable hauling distance which can be used at a cost which is not prohibitive. It is an effective and proven method, accepted by the State departments of health.

PROBLEMS

Open dumps with burning of some garbage and combustible material are the common method of solid waste handling in the small communities of the Basin. This is not an acceptable method because unburned garbage and uncovered refuse become a major breeding place for insects and rodents and burning dumps create an extensive smoke and odor problem. Costs, ignoring benefits, for dump operations are approximately 50 percent of that for sanitary landfills.

STATUS OF EXISTING PROGRAMS

State and local health departments have adequate authority to control the storage, collection, and disposal of solid wastes. Albany, College Park-East Point-Hapeville, Griffin, Marietta, Smyrna, and Muscogee County, Georgia all have sanitary landfills serving an estimated 300,000 persons. Modified sanitary landfills serve 35,000 persons located at Phenix City, Alabama; Apalachicola, and Wewahitchka, Florida; and at Cornelia, Georgia.

(5/15/62)

The City of Atlanta collects and disposes of all of the solid refuse of Fulton County with the exception of the rural areas and the College Park-East Point-Hapeville area. The wastes from 515,000 persons are disposed of through one 700 ton capacity incinerator and four modified landfills. These landfills are used generally for dumping of solid wastes other than garbage. Occasionally during overload of the incinerator they may be used for garbage. Plans are presently underway for construction of a new incinerator to double existing capacity and the opening of another landfill. Construction costs of the new incinerator program is estimated to be $3,200,000.

Another estimated 105 communities having populations of 500 or more are assumed or known to have inadequate operations for solid wastes disposal. Populations served by these facilities are estimated to be 382,000.

EXISTING NEEDS

There is a need in the Basin to extend the sanitary landfill waste disposal method to 105 communities which have inadequate solid refuse programs. All communities should follow accepted sanitary methods for the storage, collection, and disposal of wastes. If this were done the fly and rodent problem would largely be eliminated. These communities will need to provide means for financing this program and adopt sanitary regulations to assure enforcement.

Atlanta now exceeds its incinerator capacity during the summer months when garbage loads are highest. Although Atlanta's landfills are usually used for other refuse, they are operated to receive the summer overloads of garbage. It would be very desirable to have them operated as sanitary landfills at all times to prevent nuisance problems from occurring. Expansion of the incinerator is needed.

Columbus, Georgia is presently large enough to support an incinerator. However, both Columbus and Fort Benning have very successful sanitary landfill operations which might be continued as long as land costs and other costs are reasonable. This has been assumed to continue until 1975 at which time incinerators have been considered to serve the Muscogee County, Georgia area.

POTENTIAL PROBLEMS AND SOLUTIONS

Large urban areas will find the use of an incinerator more practicable where land areas for sanitary landfills are not conventiently available at reasonable costs. In densely populated counties the incinerator will also meet the needs of the area.

By 1975 the four areas needing incinerators are Albany, Columbus-Muscogee County, Atlanta-Fulton County, and College Park-East Point-Hapeville. These programs will serve a population of 1,258,000 persons.

By 1975 there will be 114 sanitary landfills serving a total population of approximately 724,200. Included in this figure is an urban population, excluding Marietta, of 101,000 persons in urban areas of Cobb County.

By 2000 the City of Marietta will have grown to the size that it can support an incinerator program. Phenix City, Alabama also will have grown to a size that it should consider an incinerator, but because of its proximity to Columbus, Georgia, it is assumed that they will combine their operations into one incinerator program. The five incinerator programs will serve a population of 2,349,700 persons in 2000.

The number of sanitary landfills by 2000 will be 114 serving a population of 1,387,300 persons. These will include six cities having populations slightly in excess of the 50,000 minimum generally required to support incinerator programs. However, since they are isolated from other densely populated areas, land is considered to be available for sanitary landfills.

Land requirements for the communities operating sanitary landfills are based on a need of one acre per 10,000 population served per year. These requirements for the period 1960-2000 are shown in Table PH-3.

TABLE PH-3
LAND REQUIREMENTS FOR SANITARY LANDFILLS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASIN

Period of Time	Number of Communities	Ave. Population to be Served	Acres Required
1960-1964	9	335,000	170*
1965-1974	115	1,434,000	1,435
1975-2000	114	1,888,000	4,720
		Total	6,325

*Does not include land requirements for modified landfills.

(5/15/62)

COSTS AND BENEFITS

Present costs for construction of incinerators ranges from $2000 to $4000 per ton daily capacity. Operational costs vary considerably with the City of Atlanta reporting $1.48 per ton for the year 1959, and $1.27 per ton for 1960. Other cities report costs two to three times this amount.

Costs of operation of sanitary landfills average $0.50 to $1.00 per ton of refuse handled. Cities as large as Los Angeles, California and New York City use this method of disposal. New York City's experience has shown that disposal by sanitary landfills costs approximately half that of incinerators.

Cost of operation of a solid refuse program including collection and disposal will vary with each community but will, depending on the size of the community, range from $1.00 to $4.50 per person per year. Based on a scaled cost, annual cost for a solid refuse program in the Apalachicola-Chattahoochee-Flint Basin is shown on Table PH-4.

TABLE PH-4
SOLID WASTES PROGRAM ANNUAL COSTS
APALACHICOLA - CHATTAHOOCHEE - FLINT BASIN

Type of Operation	1960	1965	1975	2000
Incineration				
Capital Costs	$136,000	$136,000	$244,700	$446,500
Operation and Maintenance*	700,000	700,000	1,258,000	2,349,700
Replacement	46,000	46,000	82,800	154,400
Sanitary Landfills				
Collection and Disposal	378,000	1,368,000	1,500,000	2,276,000
Total	$1,260,000	$2,250,000	$3,085,000	$5,226,000

*Includes collection costs.

(5/15/62)

The capital investment for incinerators is $2,800,000 in 1960, $5,040,000 in 1975 and $9,400,000 in the year 2000. Operation and maintenance annual costs for the incinerator program are based on $1.00 per person served. The total cost for the sanitary landfill program is considered to be all operation and maintenance. All operation and maintenance costs include collection as well as disposal of the solid refuse.

SUMMARY AND CONCLUSIONS

SUMMARY

Insect-borne diseases do not now constitute a major health problem in the Basin. The following diseases, however, do present a continuous threat: encephalitis, malaria, typhus fever, Rocky Mountain spotted fever, and conjunctivitis. A portion of enteric disease transmission in the Basin is by houseflies.

Other insect problems in the Basin are the dog flies and saltmarsh mosquitoes in the seashore counties, houseflies, and eye gnats.

Important vector problems due to man's activities include those associated with the disposal of sewage, the storage and disposal of refuse, water-holding catch basins, uncontrolled flow from artesian wells, and the accumulation and disposal of feed wastes and manure on farms.

There is no statewide enabling legislation for vector control districts in Georgia or Alabama, but adequate legislation of this nature does exist in Florida.

Present vector control programs consist of four countywide vector control programs in Florida, two of which include fair sanitary landfill operations. These programs are primarily for the control of mosquitoes and dog flies and secondarily for houseflies, rats, and other vectors. In Georgia and Alabama, vector control programs consist of several city mosquito control programs and several countywide typhus and rodent control programs.

Major sources of air pollution are concentrated in the Columbus and Atlanta areas of the Basin. Of those known, approximately two-thirds are in these areas. Very few sources occur in the Alabama and Florida portions of the Basin.

Two experimental nuclear reactors are in the Basin. Forty-four users of radioisotopes are in the Albany, Metropolitan Atlanta and West Point areas.

An estimated 105 communities in the Basin have inadequate solid wastes handling programs. Only nine known satisfactory sanitary landfills and one incinerator program are now operating.

CONCLUSIONS

Control measures and supportive services needed to reduce public health problems associated with insect and rodent vectors are:

1. State enabling legislation permitting the establishment of tax-supported vector control districts in any county of Alabama and Georgia.

2. Regulations requiring the control of wasteful flow from artesian wells.

3. More extensive surveys of vector disease occurrence and vector problems.

4. Increased training of local health department personnel in vector control intelligence.

5. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and land resource developments.

6. Development of better permanent control techniques in salt marshes to serve multi-interests.

7. Development of better equipment and methods for constructing and maintaining water management ditches.

8. Establishment of mosquito control districts in Gulf and Franklin Counties, Florida.

9. Development of countywide water management systems and programs.

10. Improved design for catch basins.

11. Increased use of sanitary landfills in towns and in counties.

12. Increased use of countywide refuse collection and disposal systems.

13. Increased use of sewers and central treatment plants in lieu of septic tanks in new subdivisions.

14. Implementation of increased programs for the control and progressive eradication of alligatorweed, water hyacinths and other obnoxious weeds in the Basin.

15. Better coordination between agencies so that vector control programs are compatible with multipurpose functions.

16. Establishment of countywide rodent control programs where none exist.

(5/15/62)

17. Initiation of a state-aid financial program in Alabama and Georgia.

Based on present knowledge, the one vector problem that appears to be on the rise and could be a significant one in the Basin in 1975 or 2000 is mosquito-borne encephalitis. At present the only control of encephalitis is a program of prevention -- mosquito control for the community (or population groups) and protection against mosquito bites for the individual. Adequate housefly control is needed to eliminate the transmission of enteric diseases by the vector route.

The statewide air pollution survey recently completed in Georgia and the completed survey in Florida should be utilized as a basis for planning programs in those two states. A similar survey in Alabama is needed. Control measured in the large urban areas of the Basin should be strengthened.

Funds are needed for the expansion of the radiological health programs of the states. The nuclear reactor operations and release of radioisotopes to the waters of the Basin should be carefully controlled. A continuous monitoring program for air, water, foods, etc. should be carried on in the Basin.

Solid wastes programs for 115 communities at an annual cost of two and one-quarter million dollars is now needed. Sanitary landfills will continue to serve all but the Atlanta area for a number of years. However, by 1975 a number of municipalities and counties can combine their operations and use incinerators very effectively.

PH - 32J

APPENDICES AND BIBLIOGRAPHY

APPENDIX
DEFINITIONS AND ABBREVIATIONS

1. cfs - cubic feet per second
2. Garbage - putrescible animal and vegetable wastes resulting from the handling, preparation and consumption of foods
3. gpcd - gallons per capita per day
4. gpd - gallons per day
5. mg - million gallons
6. mgd - million gallons per day
7. PE - population equivalent
8. ppm - parts per million by weight
9. Pollution, water - the addition of sewage, industrial wastes, or other harmful or objectionable material to water
10. Quality, water - is defined as the expression of water characteristics in terms of its physical, chemical, bacteriological, biological, and radioactive content.
11. Resources, water - is defined as the water available to serve mankind and his civilization for the varied, complex, and often conflicting beneficial uses. These uses include sources for municipal and domestic supplies, agriculture, industrial development, and for recreation, propagation of aquatic life and other forms of wildlife, navigation and ultimate waste disposal.
12. Supplies, domestic water - are those supplies used for individual families, including those also serving tenant families living on the property. Domestic supplies do not include commercial establishments, schools, churches, or camps.
13. Supplies, industrial water - are considered as industrially owned supplies, primarily developed for process or cooling purposes but which might be incidentally used for sanitary purposes.
14. Supplies, municipal water - are public supplies serving a municipality or community of 50 or more people.
15. Supplies, semi-public - are supplies for schools, motels, camps, and other supplies serving water to the public; or commercial establishments not classed as municipal or industrial.
16. Wastes, municipal - include all liquid wastes received by community sewers.
17. Wastes, industrial - the liquid wastes from industrial processes as distinct from domestic or sanitary sewage.
18. Wastes, solid (or Refuse) - includes all wastes of a solid nature not otherwise disposed of to the sewers or to the atmosphere. This includes all putrescible and nonputrescible solid wastes such as garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles, and solid market and industrial wastes.

(5/15/62)

PH - 34

19. Wastes stabilization ponds - a properly engineered and operated pond for the biological reduction of organic wastes.
20. Water supply systems - includes the works and auxiliaries for collection, treatment and distribution of the water from the source of supply to the free-flowing outlet of the ultimate consumer.

Note: For the definition of any other terms which are used in these memoranda refer to Glossary of Water and Sewage Control Engineering, 1949 ASCE.

(5/15/62)

PH-35

BIBLIOGRAPHY

1. Alabama State Chamber of Commerce. Industrial Alabama, January 1959.

2. Alabama Water Improvement Commission. Report of Study - Sampling Activities Stream Samples, 1958-1959.

3. Alabama Water Improvement Commission. Studies of Pollution in Streams of Alabama, 1949.

4. American Society for Testing Materials. Manual on Industrial Water and Industrial Waste Water. Philadelphia, Pennsylvania, ASTM Special Technical Publication No. 148-D; 2nd Edition, 1959.

5. American Water Works Association. Water Quality and Treatment. New York, 2nd Edition, 1951.

6. California State Water Pollution Control Board. Water Quality Criteria. Sacramento, California, Publication No. 3; 2nd Printing, 1957.

7. Council of State Governments. Agencies Administering Water Resources in the Southern States. Chicago, 1960.

8. Council of State Governments. Statement of Basic Water Resource Policies in the Laws of the Southern States. Chicago, December 1960.

9. Drott Manufacturing Company. What Does Your City Pay for Refuse Disposal? Milwaukee, Wisconsin, May 1949.

10. Fair, G. M., and Geyer, J. C. Water Supply and Waste Water Disposal. New York: John Wiley & Sons, 1954.

11. Federal Inter-Agency Committee on Recreation. The Role of the Federal Government in the Field of Public Recreation. Washington: Government Printing Office, Washington, D. C., June 1949.

12. Federal Radiation Council. Background Material for the Development of Radiation Protection Standards. May 13, 1960.

13. Florida State Board of Health. Pollution Survey, Apalachicola River and Apalachicola Bay, November 1947 - August 1948, Bureau of Sanitary Engineering.

14. Florida State Chamber of Commerce. Directory of Florida Industries, 1961.

(5/15/62)

PH-36

15. Florida Development Commission, Arthur D. Little, Inc. Review of Major Segments of the Florida Economy and A Report on the Public Aspects of Land Development Practices. April 1960.

16. Florida State Board of Conservation. Chemical Character of Florida's Waters 1951 with supplements through 1959. Water Survey and Research Paper No. 6, November 30, 1951. Tallahassee, Florida.

17. Florida State Board of Conservation. Salt Water Intrusion in Florida - 1953. Water Survey and Research Paper No. 9, May 15, 1953. Tallahassee, Florida.

18. Florida State Board of Health. Florida's Air Resources. February 1961.

19. Florida State Board of Health, Bureau of Sanitary Engineering. Progress Report No. 4, Radiological Surveillance Program. March 1958 through October 1960.

20. Florida State Board of Health. Sanitary Code of the State of Florida. Revised 1951.

21. Florida State Board of Health. Some Arthropods of Public Health Importance in Florida. Florida Health Notes, January 1961.

22. Georgia Agricultural Experiment Station, University of Georgia, College of Agriculture. Agricultural Resources in the Southeast River Basins of Georgia. Athens, Georgia.

23. Georgia Department of Commerce. Georgia Manufacturers - 1958 plus 1960 supplement. Atlanta, Georgia.

24. Georgia Department of Public Health. Unpublished Report, Industrial Air Pollution Problems in Georgia. September 1959.

25. Georgia State Division of Conservation. The Availability and Use of Water in Georgia. Bulletin No. 65; December 1956, Atlanta, Georgia.

26. Greene, Henry, and McCroan, J. E. Jr. "Residual Typhus Fever in Georgia," The Journal of the Medical Association of Georgia, April 1953.

27. Interstate Commission on the Potomac River Basin. Waste Treatment Guide. Washington, D. C. 1947.

(5/15/62)

28. Karstand, L. H. and others. "Eastern Equine Encephalomyelitis Virus Isolated from Three Species of Diptera from Georgia." *Science Magazine*, Vol. 125, No. 3244, (March 1, 1957), 395-396.

29. Mathis, Willis, Kilpatrick, John W., and Johnson, Harry F. DDT Resistance in A. quadrimaculatus. *Public Health Reports*, 75 (5): May 1960, 387-390.

30. McCroan, John E., Jr., Georgia Department of Public Health. "Eastern Equine Encephalomyelitis." *The Journal of the Medical* Association of Georgia. (December 1949).

31. McCroan, John E., Jr., and others. "The Status of Rocky Mountain Spotted Fever in the Southeastern United States." Presented at the 23rd Annual Meeting of the Southern Branch of the American Public Health Association, St. Petersburg, Florida, April 21-23, 1954.

32. National Association of Manufacturers and the Conservation Foundation. *Water in Industry - A Survey of Water Use in Industry*. December 1950.

33. Nordell, E. *Water Treatment for Industrial and Other Uses*. New York: Reinhold Book Division, 1951.

34. Pratt, Harry D. "The Changing Picture of Murine Typhus in the United States." Annuals of the New York Academy of Sciences, Vol. 70, Art. 3, (June 3, 1958), 516-527.

35. Rowan, Peter P., Jenkins, Kenneth H., and Butler, D. W. "Sewage Treatment Construction Costs." *Journal of Water Pollution Control Federation, June 1960*. Vol. 32, No. 6, 594-604.

36. Seelye, Elwyn E. *Data Book for Civil Engineers, Volume II Specifications and Costs*. New York: John Wiley & Sons, Inc., 1957.

37. Select Committee on National Water Resources, United States Senate. *Water Resources Activities in the United States, Water Quality Management*. Reprint No. 24 of 32, U. S. Government Printing Office, Washington, D. C. 1960.

38. Smallwood, Charles. A Special Report to the Public Health Service, Region IV, on Costs of Treating Textile Waste Waters, December 27, 1960.

39. Smith, D. B., Wakefield, J. W., Bevis, H. A., and Phelps, E. B. *Stream Sanitation in Florida, Florida Engineering Series No. 1, University of Florida*, 1954.

PH-38

40. Stern, Arthur C. "Results of Three Years of Operation of the National Air Sampling Network." Presented at the 50th Annual Meeting of the Air Pollution Control Association held at St. Louis, June 2-6, 1957.

41. Thoman, John R., and Jenkins, Kenneth H. "Per Capita Construction Costs." Engineering News-Record, Vol. 161, 64, December 25, 1958.

42. Trackson Company. Sanitary Landfills. Milwaukee, Wisconsin.

43. U. S. Department of Agriculture Administrative Report to the United States Study Commission, Southeast River Basins concerning agriculture use of land and water resources in the Georgia segment of the Southeast River Basins.

44. U. S. Department of Commerce, National Bureau of Standards. Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and Water for Occupational Exposure. Handbook 69. U. S. Government Printing Office, Washington, D. C., June 5, 1959.

45. U. S. Department of Commerce, Bureau of the Census. 1954 Census of Manufacturers plus other related supplements.

46. U. S. Department of Health, Education and Welfare, Public Health Service. A Digest of State Air Pollution Laws. 1960.

47. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center, Brody, J. A., and Dunn, Frederick L. CDC Malaria Surveillance Report - 1958. March 9, 1959.

48. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center, Pratt, Harry D. Current Status of Some Important Arthropod-Borne Diseases in the United States. Atlanta, Georgia, November 1959.

49. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center. Insect Control Training Manual. Atlanta, Georgia, 1960.

50. U. S. Department of Health, Education, and Welfare, Public Health Service. 1957 Inventory of Municipal and Industrial Waste Facilities. Public Health Service Publication No. 622, Volume 4. U. S. Government Printing Office, Washington, D. C. 1958.

51. U. S. Department of Health, Education and Welfare, Public Health Service. Municipal Water Facilities, Inventory as of January 1, 1958. Public Health Service Publication No. 775 Vol. 4, U. S. Government Printing Office, Washington, D. C., 1960.

52. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center. "The Law in Relation to Public Health (Lecture Notes of Ragner T. Westman)." Atlanta, Georgia, 1947.

53. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center, Barnes, Ralph C. Mosquitoes and their Control. May 16, 1955.

54. U. S. Department of Health, Education and Welfare, Public Health Service. Manual of Laws and Regulations, Federal Water Pollution Control Act, Public Law 660 as amended by Public Law 87-88 approved July 20, 1961. U. S. Government Printing Office, Washington, D. C. 1961.

55. U. S. Department of Health, Education and Welfare, Public Health Service. A Report of the Advisory Committee on Revision of the Public Health Service 1946 Drinking Water Standards. May 3, 1961.

56. U. S. Department of Health, Education and Welfare, Public Health Service. Public Law 159 - 84th Congress, As Amended. Washington, D. C. September 22, 1959.

57. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center. Rat-Borne Diseases Prevention and Control. Atlanta, Georgia, 1959.

58. U. S. Department of Health, Education and Welfare, Public Health Service. Register of Air Pollution Analysis, Volume II, January 1, 1956 - June 30, 1959. U. S. Government Printing Office, Washington, D. C.

59. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center. The Sanitary Landfill. Atlanta, Georgia, January 5, 1958.

60. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center, Beadle, Leslie D., and Rowe, John A. "Sewage Lagoons and Mosquito Problems." Presented at Symposium on Waste Stabilization Lagoons, Kansas City, Missouri, August 3, 1960.

61. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center. (Federal Security Agency). Source Data on Endemic Typhus Fever Morbidity. Atlanta, Georgia. October 1947.

62. U. S. Department of Health, Education and Welfare, Public Health Service, Communicable Disease Center. Surveillance of Arthropod-Borne Encephalitis in the United States--1958, December 18, 1959.

PH-40

63. U. S. Department of Health, Education and Welfare, Public Health Service, (Federal Security Agency). Report of a Chattahoochee River Investigation, 1950.

64. U. S. Department of Health, Education and Welfare, Public Health Service, for the District Engineer, Mobile District, Corps of Engineers. Report of Chattahoochee River Investigation, Fort Gaines Reservoir Project. January 1959.

65. U. S. Department of Health, Education and Welfare, Public Health Service, (Federal Security Agency), for the District Engineer, Mobile District, Corps of Engineers. Chattahoochee River Investigation. September 1949.

66. U. S. Department of Health, Education and Welfare, Public Health Service, for the District Engineer, Mobile District, Corps of Engineers. Report of Chattahoochee River Investigation, Proposed Columbia Reservoir Project, April 1959.

67. U. S. Department of Health, Education and Welfare, Public Health Service, for the District Engineer, Mobile District, Corps of Engineers. Lake Lanier Study - Limestone and Balus Creeks. February 1956, August 1956, January 1960, July 1960.

68. U. S. Department of Health, Education and Welfare, Public Health Service, for the District Engineer, Mobile District, Corps of Engineers. Pollution Survey, Flint River and Lake Seminole in the Vicinity of Bainbridge, Georgia. June-August 1958.

69. U. S. Department of Health, Education and Welfare, Public Health Service, for the District Engineer, Mobile District, Corps of Engineers. Pollution Survey of Flint River and Lake Seminole in the Vicinity of Bainbridge, Georgia. October 1960.

70. U. S. Department of Health, Education and Welfare, Public Health Service, (Federal Security Agency). Southeast Drainage Basins, A Cooperative State-Federal Report on Water Pollution. Water Pollution Series, No. 13, Atlanta, Georgia, 1951.

71. U. S. Department of Interior, Geological Survey. Hydrologic Characteristics of the Southeast River Basins. Prepared for the U. S. Study Commission, Southeast River Basins, Atlanta, Georgia, 1960.

72. U. S. Department of the Interior, Geological Survey. The Industrial Utility of Public Water Supplies in the United States, 1952. Water Supply Paper 1299, U. S. Government Printing Office, Washington, D. C., 1954.

73. U. S. Department of the Interior, Geological Survey. Surface Water Supply of the United States--1959, Part 2-B, South Atlantic Slope Basins, Ogeechee River to Pearl River, Water Supply Paper No. 1624, U. S. Government Printing Office, Washington, D. C., 1960.

74. U. S. Study Commission - Southeast River Basins. *Public Law 85-850*. U. S. Government Printing Office, Washington, D. C., 1958.

75. U. S. Study Commission - Southeast River Basins. *Water Quality Basic Data-Southeast River Basins*, prepared by the Public Health Service. Atlanta, Georgia, 1961.

76. Water Resources Committee of the National Resources Committee. *Drainage Basin Committee Report for the Southeastern Basins*. U. S. Government Printing Office, Washington, D. C. December 1937.